

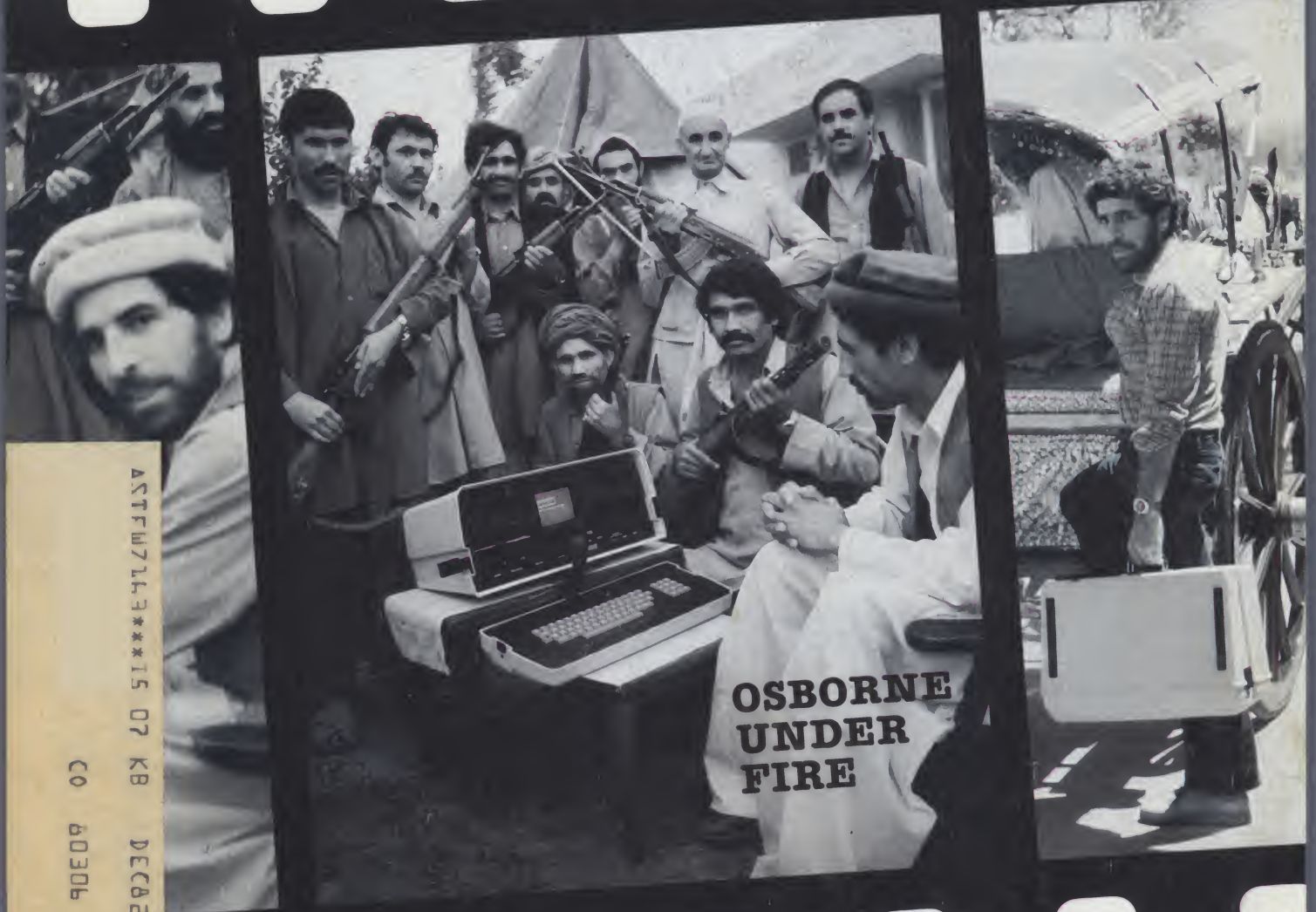
Special Section: Can You Protect Your Software?

MICROCOMPUTING[®]

A WAYNE GREEN PUBLICATION

July 1982
USA \$2.95 (UK £1.80)
Number 67

Dateline: Afghanistan



ASTFW7LH3***15 07 KB DEC82

CO 60306

Plus Apple, Commodore, Heath, IBM . . .



From Percom... System-50 Summer Save-On Sale!

Save On LFD First-Drive Systems – Proven clock-data separation circuitry and other superior design features
• Reliable hard-sector diskette formatting • Stores up to



102 Kbytes of formatted data on 40 tracks • Complete with drive (or drives), S-50 4-drive controller, MPX or MPX/9 DOS, interconnecting cable and users manual. While they last...

40-Track, one-drive, non-flippy	now \$384.95	Save \$ 75
40-Track, one-drive, floppy	now \$399.95	Save \$100
80-Track, one-drive, non-flippy	now \$520.95	Save \$100
80-Track, one-drive, floppy	now \$560.95	Save \$100
LFD 4-Drive Controller (only)	now \$ 95.00	Save \$ 20
2-Drive Interconnecting Cable (only)	now \$ 19.95	Save \$ 10
3-Drive Interconnecting Cable (only)	now \$ 29.95	Save \$ 5

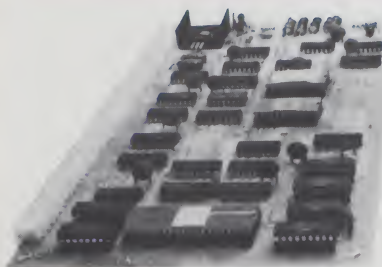
First-Drive Systems are also available in 2- and 3-drive versions. Save even more!

Save On Single-Board Computer/S-50 MPU Card now \$119.95 **Save \$20** The SBC/9 is a computer or a fully compatible SS-50 bus MPU card • Interchangeable 6802 or 6809 processor • Extendable 1-Kbyte ROM monitor • Parallel and serial I/O ports—selectable, full-range bit rate generator for serial I/O • Extendable addressing • On-card 1-Kbyte RAM • Provision for additional EPROM • On-card voltage regulator circuits.



Save On 6809 MPU Upgrade Adapter now \$31.95 **Save \$8** Upgrades 6800 MPU cards to 6809 processing power. Configured for SWTP MP-A2 MPU card but may be used with other MPUs. Plug-in installation requires no trace cutting or soldering—easy to restore MPU to original configuration. Assembled and tested. Includes user instructions. 6809 ROM operating system, PSYMON/A2, for use with the 6809 MPU Adapter—\$69.95.

Save On Memory-Mapped Video Display Generator Controllers...



The **Electric Window** features software-defined display formats, expandable 128-unit character generator, fully formed characters, composite or separate sync-video output. **now \$119.95. Save \$50.**

The **ColorAMA-50** features up to 8-color displays and 256 x 192 pixel resolution (with full display RAM), extended 1-Mbyte addressing capability, provision for audio cassette I/O and low cost rf modulator for TV displays, comprehensive manual with 6809 driver listing. **Now \$94.95 with 1K display RAM. Save \$45. Additional display RAM \$19.95/Kbyte. Save \$10.**



Save On Dual Serial I/O Card now \$54.95. **Save \$20.** This two-channel RS-232 data communications interface features an on-card bit-rate generator (BRG) (ideal for extended addressing bus) that generates seven standard rates from 110 b/s to 19,200 b/s, individually selectable TX/RX

rates for each channel, compatibility with older and newer versions of 30 pin I/O bus and either 16- or 4-byte boundary addressing. Note: Shown with optional port connectors, configuration switches and BRG installed. Also available without BRG for \$49.95. **Save \$10.**

Save On Rock Solid RAM Cards now \$94.95. **Save \$45.** Includes 8K of RAM, expandable to 24K. Each 8K block may be located at any 8-Kbyte boundary of 64K address space. Other features: 1-Mbyte extended addressing, buffered data, address and control lines, comprehensive manual with diagnostic memory test programs. Eight-Kbyte RAM kit—now \$49.95. **Save \$40.**

Versatile Prototyping Boards, Extendable Motherboards

50-pin Motherboard/Extender Board (7-slot)	\$21.95
I/O Motherboard Kit (8-slot)	\$44.95
S-50 Bus Protoboard	\$24.95
I/O Bus Protoboard	\$14.95

ColorAMA-50, Electric Window, SBC/9, PSYMON and PERCOM are trademarks of Percom Data Company, Inc.

PRICES & SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

As near as your telephone—You can save on the lowest prices ever for these quality Percom products by calling **toll-free 1-800-527-1222** (from in Texas call 214/340-7081). Don't wait! At these prices we cannot guarantee product inventories.

PERCOM
PERCOM DATA COMPANY, INC.

11220 Pagemill Road • Dallas, Texas • 75243
214/340-7081

You, your child or your secretary

can now use your computer and never have to open a book!

One hour of easy listening replaces all the confusing written manuals usually required to begin using your new computer.

When the computer is unpacked and the power is turned on, you are anxious to do more than merely admire the attractiveness of your new computer. You made an investment for a purpose! Why not get the system up and running instantly?

If your application is business, you don't really have a lot of time to study the **BIG THICK MANUALS**! They are fine for researching more advanced applications. For now you want to realize the benefits of the word and number processing power available at your finger tips!

Buy the Computer you have your heart set upon and let us teach you how to manipulate the operating system. Buy the Word and Number Processing software to let it perform all your important business functions and let us **PATIENTLY, INEXPENSIVELY** and **INSTANTLY** get the system down to the business of producing **RESULTS**!



Available nationwide at "The Xerox Stores" and other selected dealers.

PRICED UNDER \$40

These "plain language" condensed user's manuals are available now in standard audio cassette. Many others are being developed and will soon be available...

Altos ¹	IBM-PC ⁵	Vector ⁹	Magic Wand ¹³	Supercalc ¹⁷
Apple II+ ²	Osborne 1 ⁶	Calcstar ¹⁰	Mailmerge ¹⁴	Supersort ¹⁸
Atari 800 ³	TRS-80-II ⁷	dBase II ¹¹	Power Text ¹⁵	Visicalc ¹⁹
H/Z-89 ⁴	Xerox 820 ⁸	Datastar ¹²	Spellguard ¹⁶	Wordstar* ²⁰

DEALERS

Add a **CUSTOMER SUPPORT** department to your store. Use your time for **SELLING** not **TEACHING**! Your customers will have their new computer up and operating the day of purchase! **END the USER MANUAL MYSTERY, stock MICRO Instructional tapes!**

Trademarks of: 1. Altos Computer Corp. 2. Apple Computer Corp. 3. Atari Corp. 4. Heath Company/Zenith Radio Corp. 5. IBM Corp. 6. Osborne Computer Corp. 7. Tandy Corp. 8. Xerox Corp. 9. Vector Graphic Inc. 11. Ashton-Tate. 13. Peachtree Software. 15. Beaman-Porter. 16. Innovative Software Applications. 17. Sorcim Corp. 19. Visicorp. 10, 12, 14, 18, 20 MicroPro Int. Corp.

INSTRUCTIONAL INC.

6299 W. SUNRISE, FT. LAUDERDALE, FL 33313. (305) 584-3133



MICROCOMPUTING

On the cover: Microcomputing entered a new era recently when journalist David Kline, on assignment for CBS-TV, *Los Angeles Times* and *Chicago Sun-Times*, took along his Osborne portable computer to report on the guerrilla war in Afghanistan. It marked Kline's fourth visit to that country in three years, but the first using a microcomputer in the war zone to both write and file stories back to the U.S. Kline snapped the center cover photo of Afghanistan independence fighters while camped at a guerrilla hideaway somewhere near the Afghanistan-Pakistan border. Photo on the right (by Impact Features) shows the author boarding a rickshaw to transmit a story from Peshawar, Pakistan, just below the Khyber Pass. Left photo (by Impact Features) shows Kline at the rebels' hideaway.

Contents: July 1982

Volume VI No. 7

Osborne—Behind Guerrilla Lines David Kline.....42

A report from the war zone with an Osborne Computer. Osborne

A Printer Solution for the H89 J.C. Hassall.....52

Interface a correspondence-quality printer at a low cost. Heath

Numeric Storage—As Easy As 1, 2, 3... Ken Knecht.....58

Store integers in disk or tape data files.

How Safe Is Your Software? J. Commander, G. Michael Vose.....60

Stopping software-thirsty pirates from unauthorized duplication.

Software Protection—A Legal Overview Jeffry Kamenetz.....64

How adequate are present program protection laws?

Piracy—A Serious Threat or Unfounded Fear? Bill Grout.....76

Experts disagree on the seriousness of software theft.

Attaché Computing Elliott Kanter.....84

Portable computing power in an attache case from Panasonic. Panasonic

A Man's (Computerized) Home Is His Castle Bobby Jones.....90

Your dream of computerized home control can become a reality.

The Heath Memory Alternative Greg Greene.....100

Do it yourself and double your memory for less. Heath

This Printer Builds Character(s) Peter Ohs.....104

Design a character set with the Base 2 printer.

RAM It on the Apple Joe Magee.....108

Eliminates putting untried code into an expensive PROM chip. Apple

Publisher's Remarks—6

Micro Quiz—12

PET-pourri—14

Dial-up Directory—20

Letters to the Editor—37

Calendar—136

Dealer Directory—138

Classifieds—138

What's New, Big Blue?—140

(New Products for the IBM PC)

New Products—142

New Software—150

Software Reviews—162

Microcomputing (ISSN 0744-4567) is published monthly by Wayne Green, Inc., 80 Pine St., Peterborough NH 03458. Subscription rates in U.S. are \$25 for one year and \$53 for three years. In Canada: \$27 for one year only, U.S. funds. Foreign subscriptions (surface mail) —\$35 for one year only, U.S. funds. Foreign air mail subscriptions—please inquire. Canadian Distributor: Micron Distributing, 409 Queen St. West, Toronto, Ontario, Canada M5V 2A5. South African Distributor: Mi-

crocomputing, PO Box 782815, Sandton, South Africa 2146. Second-class postage paid at Peterborough, NH 03458 and at additional mailing offices. Phone: 603-924-9471. Entire contents copyright 1982 by Wayne Green, Inc. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher. Postmaster: Send form #3579 to *Microcomputing*, Subscription Services, PO Box 997, Farmingdale, NY 11737.

PUBLISHER/EDITOR

Wayne Green

EDITORIAL MANAGER

Jeff DeTray

MANAGING EDITOR

Dennis Brisson

COPY EDITOR

Linda Stephenson

ASSISTANT EDITOR

Lise Markus

EDITORIAL ASSISTANT

Daniel Muse

TECHNICAL EDITORS

Jake Commander, G. Michael Vose

PRODUCTION EDITOR

Susan Gross

ADMINISTRATIVE ASSISTANT

Michele Christian

ASSOCIATE EDITORS

Robert Baker, Ken Barbier, Frank Derfler, Jr., Peter Stark

PRODUCTION MANAGER/PUBLICATIONS

Nancy Salmon

ASSISTANT PRODUCTION MANAGER

Michael Murphy

ADVERTISING GRAPHICS

Bruce Hedin, Steve Baldwin, Fiona Davies, Jane Preston

PRODUCTION DEPARTMENT

Joan Ahern, Frances Benton, Linda Drew, Bob Dukette, Susan Hays, Theresa Ostebo, Scott Philbrick, Dianne Ritson, Mary Seaver, Betty Smith, Deborah Stone, Anne Vadeboncoeur, Irene Vail, Judi Wimberly, David Wozmak

PHOTOGRAPHY

Thomas Villeneuve, Sandra Dukette, Bryan Hastings, John Schweigert, Robert Villeneuve

TYPESETTING

Sara Bedell, Melody Bedell, Debbie Davidson, Michele DesRochers, Jennifer Fay, Anne Rocchio, Ellen Schwartz, Lisa Steiner, Karen Stewart

DESIGN CONSULTANTS

Denzel Dyer, Howard Happ, Laurie MacMillan, Joyce Pillarella, Susan Stevens, Donna Wohlfarth

EXECUTIVE VICE PRESIDENT

Sherry Smythe

GENERAL MANAGER

Debra Boudrieau

FINANCIAL COORDINATOR

Roger Murphy

EXECUTIVE ASSISTANT

Leatrice O'Neil

ACCOUNTING MANAGER

Knud Keller

CIRCULATION

603-924-9471

Pat Ferrante

BULK SALES MANAGER

Ginnie Boudrieau

ADVERTISING

603-924-7138

Louise O'Sullivan, Susan Martin, Giorgio Saluti, Hal Stephens, Marcia Stone, Office Mgr.

DIRECTOR OF ADVERTISING

David Schissler

NEW ENGLAND

ADVERTISING REPRESENTATIVE

John A. Garland
Jack Gardner
Garland Associates, Inc.
Box 314 SHS
Duxbury, MA 02332
617-934-6464 or 6546

Double your disk storage capacity...



simply by switching to Omni's new reversible disk.

If you have an Apple, TRS-80, Zenith, North Star or any other single-sided 5¼" disk drive, you can double disk capacity by simply switching to the Flip/Floppy disk from Omni. It works just like your present disks, except you can flip it over and record on the reverse side. So you can consolidate programs and files that used to require two disks. You can halve your disk requirements. And save money.

Each disk comes with some impressive specifications: They're certified error-free at more than twice the error-threshold of your system. Rated for more than 12 million passes without disk-related errors or significant wear. And precision fabricated with such standard features as reinforced hub rings.

Call Omni toll-free today. Get premium disks. Twice the capacity. A full money-back guarantee. Unbeatable price. And if you order a ten pack now, a free \$5.00 storage case as well.



Omni Resources

4 Oak Pond Avenue, Millbury, MA 01527
(800) 343-7620 In Mass. (617) 799-0197

Dealer inquiries invited.

Software Houses: We also offer duplicating and formatting services.

Free Offer!

If you order now, you'll get a free, protective plastic library case with each 10 pack.

Order today. Get the library case and great prices on premium disks.



Order toll-free (800) 343-7620.
In Mass. (617) 799-0197.

Send the following Flip/Floppy disks.

I understand they have a full 90 day money-back guarantee if I'm not completely satisfied.

System & model # _____

_____ Ten packs @ \$40.00* \$ _____

(Each equivalent to 20 single-sided disks)

*Includes plastic case

Shipping and handling \$ 1.50

5% sales tax (Mass. only) \$ _____

Total \$ _____

_____ Check (to Omni Resources)

_____ C.O.D.

_____ Master Card

_____ Visa

Card # _____ Exp. _____

Name _____

Address _____

Tel _____

Stay-at-Home Micros

Search Continues For Micro Support On Show Circuit

The Shows— How Are They Shaping Up?

With up to nine or ten shows some months, there is no way for manufacturers to exhibit at even a small percentage of them. But how much real value can strictly local shows be for people interested in seeing computers? To get a feeling for how things are going on the show circuit, I spent a weekend making a pass at three of the shows.

The first was in Dallas. While the show was perhaps a bit scant from the viewpoint of the customer, there were enough real exhibitors to keep most people happy. I say real exhibitors because I tend to be less than seriously interested in paying \$7.50 to talk with representatives of investment firms, executive search firms, encyclopedias, forms manufacturers, packaging firms, banks, newspapers,

copiers, office furniture, pocket pagers, intercom systems, and stuff like that. Well, you get a generous helping of these hangers-on at shows.

Another turn of events at shows has been the increasing entry of minicomputers such as Cado, Wang, and a seemingly unending number of others with which I am only passingly familiar. The Dallas show was made up of about 30 percent of these higher-priced, and usually less flexible, types of systems. I do sort of enjoy saying hello to the people selling these systems because they generally have such a total lack of knowledge of microcomputers. Oh, they know that micros are just toys and not for serious office work. Good game machines. But (suppressed chuckle), how can anyone seriously even consider using a toy like that for word processing?

Quite a few times I've tried to approach

the minicomputer sales firms and understand what their system could do for me. Within minutes I'm almost totally confused. If these chaps are actually selling systems the buyers must be making their choices by throwing a dart at a list on the wall.

Most of the microcomputer sellers were cooperating with the mini people to the fullest. They had their systems set up and manned by kids playing space invader games. Not that anyone could really get an understanding of what a word processor could do in a two-minute demo, or begin to understand the possibilities of an Easy-Calc program in all that hubbub.

I talked with the exhibitors, who were generally happy about the customers. Some stores said they had had more good customer prospects on the first day of the show than they needed to make the effort pay. Thus, with both the exhibitors and the customers happy, the show should be judged a success.

There was one note of bitching by both the exhibitors and the customers. They expected to see certain manufacturers, as advertised, at the show. But these manufacturers didn't attend. Having been in the show biz in the past, I understand the problems. The show firm knows that customers want to see all of the best-selling systems and so they promise them, hoping they will be covered by dealers showing the products.

Dallas on Thursday, St. Louis on Friday. The show here was downtown at the huge Cervantes Center. It was put on by the Interface Group and was substantially smaller than the Dallas show. I'd judge the mix about 50 percent micro and 50 percent mini, not counting all of the non-computer exhibits. Again the exhibitors and attendees both seemed happy with the show. Like Dallas, the traffic was brisk, with enough customers to keep most booths busy, but not enough to cause pileups.

At one exhibit in St. Louis, a chap at a booth was telling anyone who would



Monroe Systems, of Morris Plains, NJ, exhibited their new eight-bit business computer at the St. Louis show. It runs the proprietary Monroe Operating System, and Monroe is offering company-developed applications software. The Model OC 8820 Occupational Computer with video display and dual disk drives sells for \$4385.

listen that he would be foolish to buy a computer. His company, you see, provides a remote data processing service. I asked about word processing, which could be provided over the telephone line according to this business rep. Hmmm. What about financial analysis? The chap didn't seem to know what that was, but he was sure that I did not need a computer. Perhaps he was right.

I'd say there were around 80 or so exhibitors at Dallas, about 55 at St. Louis and a bit fewer at Boston, my last stop on the trek. The Boston show, also put on by The Interface Group, was about 75 percent minicomputers. There was a big tent full of Commodore systems at the entry to the show, and a wall of TI systems—all playing games. Beyond that it was almost solid minicomputers. You know, DEC, Wang, and so on.

There was one surprise at Boston—a new microcomputer. This was a new entry from the publishers of *Micro* magazine. Yep, now they're in the micro manufacturing business. Just what the industry needed—another micro!

Radio Shack was totally invisible at Boston. I didn't see a single TRS-80 anywhere! Maybe my head was spinning from all the big machinery and I missed one somewhere. Most of the other micros were missing too, so perhaps I shouldn't single them out. I saw an Apple that was being given away as a prize. Didn't see any others—no Heath, Exidy or about 75 other different microcomputer systems.

I also heard a lot of griping from the customers about this—and equal griping from some of the exhibitors of big ticket hardware that there were few, if any, customers for their stuff. Within about two hours I'd managed to say hello and talked with every exhibitor who had ever heard of Wayne Green. Dallas took me a solid five hours for the same stint—and St. Louis about four.

Desktop Visibility

While few of the minicomputer-selling firms had ever seen or heard of this magazine or *80 Micro*, most of these were familiar with *Desktop Computing*. We're doing something right. Given their mind frame, this is understandable. These people really believe that an Apple with word processing is about equivalent to trying to write with a \$25 toy typewriter. They're OK if you want to try and get along with something not much better than a hand calculator, you know.

I don't recall seeing a single IBM micro at any of the three shows. A Radio Shack store was exhibiting at Dallas, an Apple dealer at Dallas, Altos at St. Louis, and, hey, Monroe had a very nice looking micro at St. Louis! The welter of software minibooths were missing. I think the only significant software sales at Boston were from the Instant Software booth.

The Interface Group has come into the

micro field from the minicomputer industry, so the preponderance of mini exhibitors is natural. Milden, who ran the Boston show last year, which was so heavy on minis, was more micro oriented at Dallas.

Xerox was almost invisible, as was TI, except at Boston. Even Commodore was present only at Boston, with little representation elsewhere.

With close to 100 different microcomputers on the market, one might wish there was some way to get more of these systems together so prospective customers could see them in action. Perhaps, if the manufacturers could have a couple professional-looking exhibits made up to be shipped around for local dealers to use, this would keep the cost down and still allow the system to be seen and demonstrated in these small local shows.

The need for better-looking exhibits in the booths is epidemic. Even the West Coast Computer Faire seems to have degenerated to a welter of small firms with instant exhibits made with magic markers and taped up sheets of paper. This is OK for computer hobbyists, I suppose, but is hardly apt to give an impression of stability to newcomers.

Hard Disk Backups

You know, if I had a college which taught computing, I'd fill a small lab with eager teenagers working on a new recording system to provide a dependable, low-cost backup for the proliferating hard disks. This is one of the most neglected aspects of microcomputers.

The first microcomputer on the market, the MITS Altair, used a cassette storage system. To say that it didn't work very well is quite an understatement. In fact, if there hadn't been so many other parts of the computer that also didn't work well, the cassette recording system would have been a scandal.

As near as I could piece out what happened, someone at MITS grabbed a cheap cassette recorder and banged some audio tones on it. When they played it back into the computer it occasionally worked. They apparently didn't have time to go out and find someone with experience in putting digital signals on tape.

There's no indication that much more research went into most of the cassette digital recording systems that followed. I recognized the problem back in September 1975 and organized a meeting of the microcomputer industry to tackle the problem. This meeting was held in November 1975 in Kansas City, with every major manufacturer present. The Kansas City Standard for cassette digital recording was established there.

Unfortunately, it was at this precise time that I suddenly found *Byte* taken out of my hands. By the time I had a new magazine for the field started (this one), it was too late to try and make the new "standard" stick. The people who took

Byte from me seemed to care little about any of this, so they did nothing to get the manufacturers to support the proposed standard.

The audio people have been pursuing their ends, and have been doing some remarkable work on getting a lot of music on a little bit of tape. They've crammed four channels on one-eighth inch of cassette tape—with darned good response, too. It's now time for some group to see what can be done about putting our blessed digital signals on these cassettes.

For instance, if we set up a cassette recording system that lays down the four channels all at the same time, we could get a lot of density on the tape. We're doing something like this with our hard disk systems, which record on both sides of two disks at the same time, splitting the data between the four faces.

Perhaps we need to experiment with something more analog than digital in technique. We might use two tones on each of the four channels, thus being able to put our bytes down one at a time on the tape. Or we could use four tones and thus get nine combinations of tones to represent eight bits and a parity bit. In this way we might be able to use the four channels for four bytes at a time.

With a C-120 tape we would have a one-hour four-channel tape. Since we would use this for hard disk backup—not for any use other than in an emergency—the speed of the system is almost irrelevant, as long as it is inexpensive and error free. By using tones we might not need the special tape formulations that are such a nuisance for most of our present digital systems. We might be able to get away with using a good high-quality music tape, which would be relatively inexpensive.

In the seven years I've been publishing about microcomputing, I don't recall any definitive article on audio tape recording. It is almost time to do the work that should have been done years ago and come up with a good cassette recording system for hard disk backup. I'll tell you this, it will sell.

It's time to try some tone recording of our bytes, too. By using separate tones or even pairs of tones in frequency or phase shift, we might be able to put each byte down simultaneously on the tape channels. We have some remarkable ICs for separating tones these days. There are many techniques that should be tried.

A Further Idea

Once we have a good cassette recording system we might be able to use it for one other backup service. Since there are plenty of low-cost, battery-operated cassette drives, how about arranging to put a battery backup on our computer memory if the power suddenly goes off? Then we could dump the memory onto the cassette tape, running the recorder with Nicads, which are normally on a floating charge from the system.

You know how disastrous it is trying to get things back into operation after a momentary power glitch, or after someone trips over the computer power cord. It would be a whole lot easier to have the computer memory automatically saved when the power fails.

Security

Have you wondered at the almost total lack of articles on security for small computers? Oh, you'll find many of them in the professional magazines on large systems, but for some reason there has been a lack of interest for our micros.

As microcomputers are used more and more for business purposes, we must have some security for our data. Most small and medium businesses like to keep salary levels confidential. But if the payroll is kept on the computer, what is to stop anyone from running off a copy of it?

One approach is to build in some passwords that will restrict the access of data to those who are supposed to use it. But you know as well as I that it doesn't take much of a software technician to find a way around most of these software systems.

The executive who has all of the sales figures for the firm in his computer so he can print out sales charts or look at projections of sales really doesn't want to

have to worry about his data being stolen.

Sales, income, payroll and many other figures are best kept confidential. We need to have far more secure systems for handling these sensitive business figures. We don't want employees to be able to run off copies of anything they want—during the day or night. We don't want competitors getting our data—from a bribed employee, a disgruntled fired employee or by industrial espionage. Believe it or not, we've been broken into and had things stolen from us by a competitor. And that's up here in Peterborough, New Hampshire!

Government Secrecy

For years anyone doing much work with encryption found themselves up against the government. There was—and still is, I believe—strong pressure to keep the whole subject quiet and out of print. The government doesn't want Russia to know how smart we are at codes, so there has been a lid on the subject. They also don't want anything published that might possibly help Russia.

Well, that's OK, as long as it doesn't get in the way of some of the simpler encryption ideas that would benefit small business. I don't expect that we'll need to get into codes that would require a Cray computer a week to tackle.

Speaking of that, I gather that the fed-

eral data encryption standard may have been designed specifically so that it could be broken by government computers.

The field is an arcane one and, while most of us would get lost trying to keep up with the methods of breaking codes, we still need to know how to apply them to our computers.

Articles on the use of encrypting data for micros are in order at this time. While there are some benefits to having the data in unencrypted form in your own computer and just encoding it when the data is being sent over lines to another system, our best bet is to put the data on our disks in coded form so that even if the disk is stolen or accessed the data will not be readable.

Most professionals want to be able to keep their data in a secure form. Doctors must have good patient records, but they should be private. Psychologists have an even greater need for privacy—as do consultants, lawyers, and so on. We need some good security systems for our micros and we need 'em now.

I'm looking for articles to help us with this. I'm not, as I said, interested in esoteric cryptologica, just in practical systems that readers will be able to use. The solution can be software or a combination of some simple hardware and software—or whatever will do the job effectively without being too complicated.

Circle 187 on Reader Service card.

DISCOUNT PRINTER RIBBONS

Brand New, Top Quality, Exact Replacement Ribbons & Cartridges. These Ribbons Produce **Super Jet** Black Impressions and Ultra Reliable Print Life. They Are Delivered to Your Door Promptly for Much Less Than Most Retail Stores

★SPECIAL! BUY 10 and GET ONE FREE!

YOUR PRINTER	PACK SIZE	RETAIL LIST**	YOUR WHOLESALE PRICE	SIZE	COMMENTS	CAT. ORDER#
ANADIX 9000 Series	1 pk	14.00 ea	14.00	500'	Nylon Jet Blk	C-777
CENTRONICS 700-703, 737, 779	3 pk	18.95/3 pk	11.95/3 pk	563" x 45'	Nylon Jet Blk	C-700
CENTRONICS 100, 101A, 102, 103, 300, 301, 306, 308, 330, 358, 398, 500, 501, 503, 508, 588, 620, 820	3 pk	26.33/3 pk	17.55/3 pk	1" x 108'	Nylon Jet Blk 5 mil High Speed	C-100
CENTRONICS 704-705	1/pk	16.95 ea	13.95/Giant Cart	5-16" x 210'	Giant Cart	C-7045
DEC 1/2 x 40YD	3/pk	17.77/3 pk	12.95/3 pk	1.2" x 120'	Double Spools	R-600
DEC 1/2 x 60YD	3/pk	20.12/3 pk	14.25/3 pk	1.2" x 180'	Double Spools	R-644
DIABLO HYTYPE II (M/S BLK) HI YIELD. FITS 70 PRINTERS!	1/pk	9.31 ea	6.87 ea	5.16" x 180'	300,000 plus imp.	C-511
EPSON MX70, 80	1 pk	16.00 ea	16.00 ea	500" x 60'	Nylon Jet Blk	C-522
IBM "SILVER DOLLAR" Sys. 34, Sys. 32 MDLA Series	5/pk	5.80 ea	14.90/5 pk	9.16" x 30'	Nylon Jet Blk	R-300
IMDL4974, 5256, 3287, 3770, 3771-3774, 4974, 5100, 5103, 5110, 5228, 5256, 5320MDLA						
IBM - HARMONICA 1/2" SERIES 1. MOD 4973/II, 3200, 3289, MOD 2	3/pk	9.42 ea	20.85/3 pk	1.2" x 108'	Nylon Jet Blk	C-350
NEC SPINWRITER	4/pk	23.40/3 cart	23.60/4 pk rlb reload	1.2" x 51'	Nylon/Ex Lng Life	R-400
QUME (FITS 80 PRINTER MODS)	3/pk	18.00/3 pk	13.95/3 pk	1.4" x 310'	Multistrike Film	C-525
RADIO SHACK DAISY WHEEL II	1 pk	24.95/3pk	8.25	250"	Mylar Multistrike	C-789
RADIO SHACK LP11, LPV	one/pk	13.95/cart	8.95/Reload rib* only	500" x 45'	Nylon Incl Instr	R-T3
RADIO SHACK LP11, LP1V	3/pk	18.95/3 pk	11.95/3 pk	563" x 45'	Nylon Jet Blk	C-700
TELETYPE MOD 33, 28, 35, 37, 38, 88	10/pk	2.40 ea	13.90/10 pk	1.2" x 36'	Nylon Jet Blk	R-450
WANG M/S 5541W, WC, 5581, WD, 6581W, 2281W	1/pk	6.85 ea	5.95 ea	5.16" x 393'	Multistrike Film	C-550

40% OFF!! OR MORE!



TERMS:

MINIMUM PURCHASE - **\$20**
PAYMENT BY: C.O.D. (UPS), CHECK, MASTER CARD, OR VISA CHARGE CARD.

VOLUME DISCOUNTS:

20 - 50 PACKS **10%**

51 - 100 PACKS **15%**

*UNDER \$20, ADD \$5 HANDLING.

**APPROX. RETAIL. PRICE VARIES.

ANCIE LABORATORIES

5200-J Philadelphia Way 301-345-6000 (Wash. D.C. Local)
Lanham, Maryland 20706 301-792-2060 (Balto. MD Local)
800-638-0987 (National)

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

ANCIE Laboratories
5200-J Philadelphia Way
Lanham, Maryland 20706

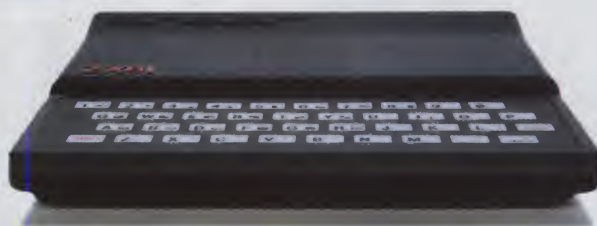
301-345-6000 (Wash. D.C. Local)
301-792-2060 (Balto. MD Local)
800-638-0987 (National)

QTY CAT.# AMT.

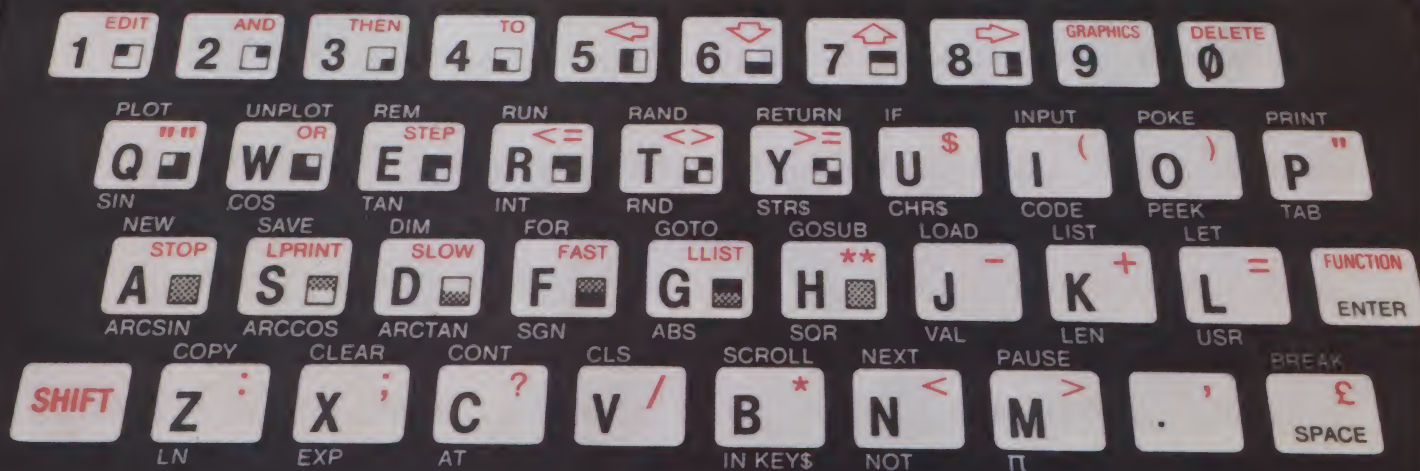
TOTAL _____

☐ Check Enclosed
☐ C.O.D.
☐ VISA
☐ MASTER CHARGE
ACCT. # _____
EXP. DATE _____
MIN. ORDER \$20
PRICES SUBJECT TO CHANGE

**Finally
you can afford
to satisfy
your lust for
power.**



ZX81



For \$99.95 you can have a full powered personal computer.

Most people know by now that the ZX81 from Sinclair Research is the lowest priced personal computer in the world.

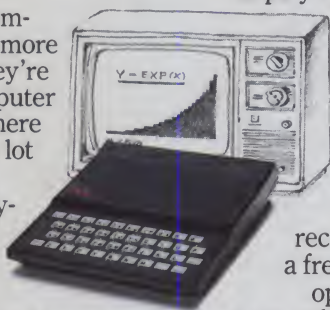
But serious programmers are looking for more than a low price. They're looking for true computer power. And that's where the ZX81 surprises a lot of people.

Just look at the keyboard and you'll get some idea of the ZX81's power. It has more than 60 BASIC commands, 20 graphic symbols, and complete mathematical functions. And there's even more power that you can't see.

A breakthrough in personal computers. The ZX81 offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics
- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function useful for both games and serious applications
- Built-in interface for ZX Printer
- 1K of memory expandable to 16K
- A comprehensive programming guide and operating manual



Sinclair programs are available



16K Memory Module

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. And you can use a regular cassette recorder to store and recall programs by name.

What you get. When you order your ZX81, you get everything you need to start programming.

It comes with connectors for your TV and cassette recorder, an AC adaptor, and a free programming guide and operating manual that completely documents the capabilities of the ZX81.

Options and add-ons. Like any full-powered computer, the ZX81 can be expanded and upgraded.

Its 1K memory can be expanded to over 16K just by plugging the Sinclair Memory Module onto the back of the unit. The cost is only \$49.95.

Sinclair has also published pre-recorded programs on cassettes for your ZX81. We're constantly coming out with new programs, so we'll send you our latest software catalog when you order your computer.

How did we do it? The question most often asked about the ZX81 is, "How can so much computer power cost so little money?"

The answer is that Sinclair Research simply took a different approach. Our only goal was to make programming power as affordable as possible. So we developed a radical new design that cuts costs dramatically without cutting computer power. For example, our unique Master Chip replaces as many as 18 chips used in other personal computers.

The success of the ZX81 speaks for itself. It is now the fastest-selling personal computer in the world. And we stand behind our product. If anything goes wrong in the first 90 days, we'll repair or replace your unit free of

charge. Even after that, you can take advantage of our national service-by-mail facilities for a minimum fee.

Order now and try it out for 10 days. Simply send the coupon along with a check or money order. For faster delivery, call our toll-free number and use your MasterCard or VISA.

You have 10 days to try out the ZX81. If it isn't all we say it is, just send it back and we'll refund your money.

Why wait any longer? With the Sinclair ZX81, you can finally afford to have the computer power you've always wanted.

Call toll free 800-543-3000. Ask for operator #509. In Ohio call: 800-582-1364; in Canada call: 513-729-4300. Ask for operator #509.

Phones open 24 hours a day, 7 days a week.

Have your MasterCard or VISA ready.

These numbers are for orders only. If you just want

Free guide to programming information, please write: Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

To order call toll free: 800-543-3000.

AD CODE 07KM	MAIL TO: Sinclair Research Ltd., One Sinclair Plaza, Nashua, NH 03061.		
	PRICE*	QTY.	AMOUNT
ZX81	\$99.95		
16K Memory Module	\$49.95		
Shipping and Handling	\$4.95		\$4.95
*U.S. dollars	TOTAL		
Name			
Address			
City	State	Zip	

Sinclair technology is also available in Timex/Sinclair computers under a license from Sinclair Research Ltd.

sinclair

Let's not get into details of how to break codes, just how to use them. I'm a crypto fan...to an extent. I can whip through the cryptos in the papers and puzzle magazines in record time, but still I'm not into it for more than just games. So, experts, tell us what we need to know.

Timex = Opportunity

Clive Sinclair has been doing a first-rate job of getting his ZX-81 computers into the hands of people interested in learning about small computers. He's been selling mostly via mail order so far. Starting in July, Timex will take over, selling the small computer through their chain of dealers. This is good news for you.

There will be a need for a wide range of articles on the system for us to publish in this magazine. People want to know what can be done with the system, what applications it can be used for, how it can be expanded and what accessories are available.

There will also be an almost endless need for software for the system. This is one of the first computers that can be called a home computer, so applications for the home and for the office at home will be needed.

Instant Software will be working to convert as many of their programs to the Timex as possible. They will be looking

for new programs geared for this computer. The need is there and will be growing rapidly.

Programs are needed to make the TS-1000 into a calculator, a computer terminal, a small communications system for the office or perhaps a portable word processor like the Sony Typecorder. The TS-1000 could also be used for ham applications such as RTTY and CW, to read and write bar code and as a simple encrypting system to protect data and communications. Games, educational programs, scientific programs, all will be available in profusion for this system, and will perhaps be sold in K-Marts.

This is both good news and bad, to some degree. In the past it has been relatively simple to go into business as a software publisher with only two or three programs. By placing mail-order ads in this magazine, *80 Micro* and others, he could build up a respectable business. But this time we're looking at an infinitely larger market. This time the programmer who tries to work through a small firm can miss the boat, which looks as if it will be loaded with gold.

It is going to take a fairly good-sized publishing firm to tackle this order of magnitude of distribution. With a \$100 computer we are not looking at \$25 and \$50 programs, we're looking at a market for \$5 and \$10 programs, sold by the tens and hundreds of thousands. Oddly

enough, few of the "larger" software publishers have developed the organization and the equipment to deal with this type of mass marketing. Most of the larger firms got that way selling a few high-profit programs. This may turn that part of the market upside down.

Instant Software is still looking for reps to cover a few parts of the country. These reps work 100 percent for the firm, visiting computer stores, book stores, electronic stores...and perhaps K-Marts to distribute software, books, magazines, and so on. Anyone with some enthusiasm can do very well. If you're looking for something with a big future which you can start at home, think in terms of getting into this new field as a rep, a programmer or a writer. □

MICRO QUIZ

What Does This Program Do?

What number is printed when the following program is executed?

```
10 READ N, D
20 R = N - INT(N/D) * D
30 IF R # 0 THEN N = D; D = R; GOTO 20
40 PRINT D
50 DATA 1430, 273
```

(answer on page 137)

COOSOL DISCOUNTS

PRINTERS



- EPSON MX70 CALL
- EPSON MX80 CALL
- EPSON MX80 F/T CALL
- EPSON MX 100 CALL
- NEC PC-8023A-C \$555
- ANACOM ANC150P OR S \$1195
- ANACOM ANC160P OR S \$1465
- TALLY MT-1602 OR 5 \$1495
- TALLY MT-1802 OR 5 \$1795
- NEC 3510-1, 3515-1, 3530-1 \$1795
- NEC 7710-1, 7715-1, 7730-1 \$2495
- NEC 7720-1, 7725-1 \$2995
- C.I.TOH FP 1500 25PU, H, OR Q \$1350
- C.I.TOH FP 1500 25RU \$1450
- C.I.TOH FP 1500 45PU OR Q \$1795
- C.I.TOH FP 1500 45RU \$1995
- HP-PRINTERS \$ CALL

HEWLETT PACKARD

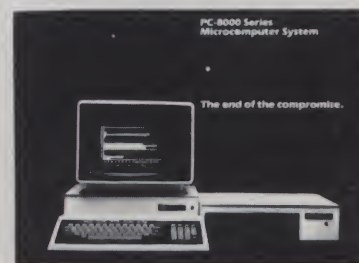


- HP-125 Microcomputer \$2995
- HP-85A Microcomputer \$2195
- HP-83A Microcomputer \$1595
- HP 85/83 16K Memory Module .. \$169
- HP7225B Graphics Plotter \$1959
- HP-5 1/4" Dual Disk Drive \$1995
- HP-5 1/4" Single Disk Drive \$1249
- HP 8" Dual Disk Drive \$5395
- HP-Other Mass Storage Units .. CALL
- HP-9111A Graphics Tablet \$1595
- HP Firmware CALL
- HP Software Packages CALL
- HP Interfaces CALL

OTHER COMPUTERS

- ALTOS MTU/Floppy/Harddisk . CALL
- ADDS Computer Systems CALL
- ATARI Computer and Accessories CALL

NEC COMPUTER



- NEC Computer PC-8001A CALL
- NEC I/O Unit PC-8012A CALL
- NEC I/O Port PC-8033A CALL
- NEC Disk Drive PC-8031A CALL
- NEC Disk Drive PC-8032A CALL
- NEC Dot Printer PC-8023A-C .. CALL
- NEC GR Monitor JB-1201 CALL
- NEC COL Monitor JC-1202 CALL
- NEC Accessories & Software... CALL

TELEVIDEO TERMINALS

- 910C \$595
- 920C \$750
- 912C \$705
- 950C \$959
- ADDS Viewpoint WB2101 or WB2102 \$595

Circle 292 on Reader Service card.

COOSOL, INC.

P.O. BOX 743, ANAHEIM, CALIFORNIA 92805-0743

Calif.(714) 545-2216 (800) 854-8498

Explore the excellence of your ZX81 with a

MEMOPAK

MEMOPAK

MEMOPAK

MEMOPAK

MEMOPAK



MEMOPAK 64k memory extension for **\$179.95** Give your diminishing memory more byte.

MEMOPAK 64K RAM \$179.95

The Sinclair ZX81 has revolutionized home computing. The MEMOPAK 64K RAM extends the memory of ZX81 by a further 56K to a full 64K. It is neither switched nor paged and is Directly Addressable. The unit is user transparent and accepts such basic commands as 10 DIM A (9000). It plugs directly into the back of ZX81 and does not inhibit the use of the printer or other add-on units. There is no need for an additional power supply or leads.

Description of memory

0-8K . . . Sinclair ROM

8-16K . . . This section of memory switches in or out in 4K blocks to leave space for memory mapping, holds its contents during cassette loads, allows communication between programs, and can be used to run assembly language routines.

16-32K . . . This area can be used for basic programs and assembly language routines.

32-64K . . . 32K of RAM memory for basic variables and large arrays. With the MEMOPAK 64K extension the ZX81 is transformed into a powerful computer, suitable for business, leisure and educational use, at a fraction of the cost of comparable systems.

MEMOTECH

Memory Extension Specialists

Memotech Corporation
7550 West Yale Ave., Suite 200
Denver, Colorado 80227
Ph. (303) 986-1516

MEMOPAK 16K RAM \$79.95

With the addition of MEMOPAK 16K, your ZX81 will have a full 16K of Directly Addressable RAM. It is neither switched nor paged and enables you to execute longer and more sophisticated programs and to hold an extended data base.

The 16K and 64K Memopaks come in attractive, custom-designed and engineered cases which fit snugly on to the back of the ZX81 giving a firm connection.

Free service on your MEMOPAK

Within the first six months, should anything go wrong with your MEMOPAK, return it to us and we will repair or replace it free of charge.

Try MEMOPAK with no obligation

You can use our MEMOPAK in your home without obligation. After 10 days if you are not completely satisfied, simply return it for a full refund.

Coming soon

A complete range of ZX81 plug-in peripherals:

MEMOTECH Hi-Res Graphics
MEMOTECH Digitising Tablets
RS232 Interface
Centronic Interface and
Software Drivers

All these products are designed to fit "piggy-back" fashion on to each other and use the ZX81 power supply.

Further information forthcoming.

Memotech Corp. 7550 W. Yale Ave. Suite 220 Denver, Colo. 80227

Yes! I would like to try the Memopak. I understand that if I'm not complete satisfied, I can return it in 10 days for a full refund.

☐ **Check**

☐ **Visa**

☐ **MC**

	Price †	Qty.	Amount
Memopak 64k RAM	\$ 179.95		
Memopak 16k RAM	\$ 79.95		
Shipping and Handling	\$ 4.95		\$ 4.95
Total			

Act. No.

Exp.

† U.S. Dollars

Name

Street

City

State

Zip

Keeping Up With Word Pro

Splitter Program Cuts Data Files Down to Size

Word Pro Splitter

Many user's groups and software houses use Word Pro to provide documentation on disk, instead of or in addition to providing printed documentation. This was all fine and dandy when Word Pro was the only version.

However, when the 80-column Commodore systems were introduced, along came Word Pro 4, and the even newer plus versions. Now there's a problem, since the newer versions only allow a little over 100 lines per file while the original Word Pro 3 allowed about 350 lines. Thus you may not be able to read some files created by Word Pro 3 if you're using the newer versions. The files are just too big to load into memory and no provisions were ever made in the newer Word Pro versions for reading partial files.

Here's a simple utility program that I recently wrote which should help solve the problem (see Listing 1). It lets you copy Word Pro files and split them into smaller files that can then be handled in the normal way by Word Pro. It does not, however, convert between Word Pro 3 and 4 formats of 40 or 80 characters per line. You can usually do this by hand, although it's time consuming. Or you can check my Word Pro Converter program that appeared in the Sept./Oct. 1980 issue of *Compute* magazine.

When this program is run, it first prompts for the name of the Word Pro file to be read. You can optionally specify the drive number by a leading 0 or 1, followed by a colon and the filename. When including a drive number you must enclose the entire input string with quotes to avoid input errors. If no drive number is given it will default to 0. The drive number can be specified in this manner in any filename entered to the program.

After successfully opening the input file the program will then prompt for the

desired output filename. Again, you have the option of specifying a drive number in with the filename; when a specific drive number is not entered it will default to 0.

Listing 1. PET utility for converting Word Pro files.

```

100 REM *****
110 REM
120 REM UTILITY PROGRAM FOR SPLITTING
130 REM WORD PRO DATA FILES ON DISK
140 REM
150 REM -----
160 REM
170 REM
180 REM
190 REM
200 REM *****
210 :
220 PRINT"WORD PRO SPLITTER": PRINT
230 PRINT"DISK FILE NAMES MAY BE PREFIXED WITH"
240 PRINT"A DRIVE NUMBER AND COLON IF DESIRED"
250 PRINT"BUT MUST BE ENCLOSED IN QUOTES": PRINT
260 L=40 : REM ← CHANGE TO 80 FOR WORD PRO 4
270 L$="-----"
280 POKE 59468,14 : REM UPPER/LOWER CASE MODE
290 D$(1)="R": D$(2)="W"
300 :
310 REM -----
320 REM OPEN FILES
330 REM -----
340 :
350 P$="READ INPUT": F=1: GOSUB 780
360 GET#1,A$,B$
370 CLOSE 2: M=1
380 P$="NEW OUTPUT": F=2: GOSUB 780
390 PRINT#2,A$;B$;
400 IF M=1 THEN PRINT"COPYING...": GOTO 420
410 PRINT"DELETING..."
420 PRINT L$
430 :
440 REM -----
450 REM READ A LINE
460 REM -----
470 :
480 FOR X=1 TO L
490 GET#1,C$: IF ST<>0 OR DS<>0 THEN 900
500 C=ASC(C$): IF C=31 THEN C=95: GOTO 540
510 ON (C/32)+1 GOTO 530, 540, 520, 530
520 C=C+64
530 C=C+64
540 PRINT CHR$(C); :IF M=2 THEN 560
550 PRINT#2,C$: :IF DS<>0 THEN 910

```

More →

Address correspondence to Robert W. Baker, 15 Windsor Drive, Atco, NJ 08004.

Listing continued.

```

560 NEXT X
570 :
580 REM -----
590 REM CHECK FOR KEYBOARD INPUT
600 REM -----
610 :
620 GET C$: IF C$="" THEN 480
630 PRINT L$
640 PRINT "N=NEW FILE, Q=QUIT, C=COPY, D=DELETE"
650 PRINT "    SPACE=CONTINUE IN SAME MODE"
660 GET C$: IF C$=" " THEN 400
670 IF C$="N" THEN 370
680 IF C$="C" THEN M=1: GOTO 400
690 IF C$="D" THEN M=2: GOTO 410
700 IF C$="Q" THEN 930
710 GOTO 660
720 :
730 REM -----
740 REM SUBROUTINE TO GET FILENAME
750 REM AND OPEN FILE FOR READ/WRITE
760 REM -----
770 :
780 PRINT P$: " FILE .(###)"
790 INPUT F$: IF F$="." THEN 780
800 C$=LEFT$(F$,2): CLOSE F
810 IF C$<>"0:" AND C$<>"1:" THEN F$="0:"+F$
820 OPEN F$,8,(4*F),F$+ ".P,"+D$(F)
830 IF IS<>0 THEN PRINT IS$: PRINT: GOTO 780
840 RETURN
850 :
860 REM -----
870 REM END OF FILE & ERROR CHECKING
880 REM -----
890 :
900 IF ST=64 AND IS=0 THEN PRINT L$: GOTO 930
910 PRINT: PRINT L$: PRINT "ST= "; ST
920 PRINT IS$
930 CLOSE 1: CLOSE 2

```

```

100 rem "Wordcraft files to screen or printer by Stephen C. Vautier 1982"
110 rem sends wordcraft files saved as a
120 rem "d" or "b" type file to ascii printer, cbm printer or screen.
130 rem if your printer is a cbm model then delete
140 rem lines 280-290
150 printchr$(147);chr$(17);chr$(17);chr$(17);"enter the name of the file"
160 print"that you wish to have printed"
170 input n$:n$=left$(n$,len(n$)-1)+"$
180 print:print"options"
190 print"1) send file to screen";print"2) send file to printer"
200 print"3) both":input op
210 if op=2 or op=3 then open 2,4
220 if op=1 or op=3 then printchr$(14)"Press . to start and stop display"
230 dopen#1,(n$),d0;if op=1 or op=3 then print""
240 get#1,b$:if st=64 then 330
250 if b$=""then b$=chr$(0)
260 if op=2 or op=3 then print#2,b$;
270 if op=2 then 240
280 if asc(b$)>64 and asc(b$)<91 then a=asc(b$)+128;b$=chr$(a):goto 320
290 if asc(b$)>96 and asc(b$)<123 then a=asc(b$)-32;b$=chr$(a)
300 if b$=chr$(12) or b$=chr$(140) then gosub 370:goto 240
310 get a$:if a$="." then gosub 340
320 print b$;goto240
330 close:end
340 get a$:if a$="" then 340
350 if a$<> "." then 340
360 return
370 print:c$="press any key to continue"
380 printtab(40-len(c$)/2);c$;"";
390 get a$:if a$=""then 390
400 printchr$(147);chr$(17);chr$(17);chr$(17);return
410 end

```

Listing 2. PET program for printing Wordcraft source files. (Courtesy of Stephen Vautier, Allen Park, MI.)

Once the output file is opened, the program will copy each line read to the new output file while displaying each line on the screen. Each line should appear just as it normally would be displayed by Word Pro. If you press any key on the keyboard (except run/stop) while a line is being displayed, the program will stop at the end of that line and prompt for the action you want to take.

Pressing N will close the current output file and prompt for a new output filename. The new output file will be opened and the program will continue copying lines, but now to the new output file. This process can be repeated as often as necessary to create any number of smaller files from one larger Word Pro file. Each file can be uniquely named and can reside on either drive.

Pressing Q after stopping the display will close both the input and the output files and terminate the program. Thus, the remainder of the input file is simply discarded and will not appear in the last output file created.

The C and D keys let you resume reading the input file while copying or deleting the lines read. This lets you selectively delete blocks of text in the middle of a Word Pro file. You can toggle back and forth between copying and deleting as often as desired.

Pressing the space bar when the display is stopped will resume reading the input file while copying or deleting lines. This allows you to suspend and resume the display without affecting the current mode of operation. This gives you a way to pause the display if it is too fast for you to read.

The program is currently written for reading Word Pro 3 (40-column) files on a 40-column PET. If you have an 80-column CBM (8016, 8032, etc.) and you are reading Word Pro 3 files, then add a Print command preceded by a colon at the end of line 560.

560 NEXT X: PRINT

This will keep the display correct for the Word Pro 3 format of 40 characters per line.

If you are reading Word Pro 4 (80-column) files on any Commodore system, then change the value of L in line 260 from 40 to 80. The value of L controls the number of characters per line in the Word Pro files, and it must be set correctly to be able to later load the files created.

Word Pro text is saved as a memory dump; it shows as a program file in the disk directory. Line 390 writes the first two bytes of every new output file opened, with the first two bytes read from the input file when it was first opened (line 360). This sets the load address in each file to the correct address for Word Pro, as read from the original Word Pro file.

The characters in the Word Pro file are the same as those used when poking directly into the display memory. Lines 500 to 540 of this program show an easy

way to convert from the screen memory values back to the normal ASCII values for printing. However, a special test is added here in line 500 to fix the back-arrow character used by Word Pro.

So there you have it! I think the options I've included in the program provide all the tools you need to prepare a Word Pro file to load into memory with Word Pro. Just remember to suspend the display (by hitting any key except the run/stop) prior to entering any desired command letter. The commands are only recognized once the display is stopped, and you can only suspend the display at the end of a line. After you've hit a key wait till the end of the line before hitting anything else.

Wordcraft Utility

In January's column I included a utility for printing Word Pro source files from disk, including the Word Pro commands along with the text. Stephen Vautier, of Allen Park, MI, has a program that does the same thing for Wordcraft files (see Listing 2). His version has several options to allow printing on ASCII or CBM printers, or to just display the file on the screen. If you're using Wordcraft you may find this simple utility quite handy.

New VIC-20 Software

Transonic Laboratories recently announced several interesting programs for the VIC-20. Each of their currently available programs is provided on cassette tape with appropriate documentation for only \$4.95 postpaid.

ROM Detective is a simple disassembler written in Basic. It lets you examine machine-language programs such as those stored in the VIC-20 ROM. It features all standard mnemonics and uses standard addressing mode syntaxes. Each line displays the hexadecimal location of the instruction and the disassembled instruction itself. The actual hex data that is disassembled is not displayed. It does, however, display the absolute address of all branch instructions instead of the relative offset. One other handy feature lets you convert between hex and decimal numbers. The program doesn't provide output for the VIC-Printer, but you should be able to add that easily enough.

They also have a machine-language monitor program for the VIC-20. It displays the program counter and the byte pointed to by the program counter, along with the accumulator and the X, Y and status registers. The stack register is not displayed and cannot be directly accessed via the monitor. Function keys let you step forward and backward through memory or step through the displayed fields to change them as you wish.

Hitting the H key displays a 48-byte

hexadecimal dump of an area of memory starting at the current program counter location. Typing Q will exit the monitor and return to Basic. Typing G will start program execution at the current program counter location. The program is called as a subroutine with an RTS instruction required to return to the monitor. This is slightly different from other 6502 monitors that normally use the break instruction to return to the monitor. Also, the program counter is used for all memory references, including modifying memory locations. You can't modify locations displayed by the memory dump function.

This monitor resides at the top of RAM memory, with separate versions available for different memory configurations. Because it is at the top of memory, you can't use it to develop machine-language programs that you would normally want at the top of memory. The three pages of documentation provided include information on several subroutines within the monitor that can be used by other programs or extensions to the existing monitor. You must follow the loading instructions exactly or the program won't load in the right location and won't run.

As the documentation states, this is a simple monitor but it provides enough features to be useful in working with machine-language programs. It's nowhere near as good as the VIC-Monitor cartridge from Commodore, but at \$4.95 it may still be worthwhile for those just dabbling in machine language.

The other program from Transonic Laboratories that I tried was their Torture Chamber of Doctor X. This is a simple but challenging game with color graphics and sound. Separate skill levels make it suitable for both children and adults. The program is split into two parts—the first provides instructions and automatically loads the second. The game uses peek and poke commands and won't run with an 8K expander installed. Also, you must have a standard Atari joystick for game control—the program doesn't allow keyboard control.

Another program, called Sprintyper, was mentioned in Transonic's price sheets. This is supposed to be a game for improving your typing skills, and sounds pretty good from the description. All of the programs I tried were of good quality and nicely documented. For more information on these and other VIC-20 programs, you can write to Transonic Laboratories, 249 Norton St., Mankato, MN 56001. They also intend to include programs for the CBM 8032 some time in the future.

Misc

A recent press release from Commodore announced three new systems that were to be shown for the first time at the Hanover Fair in Germany during late

April. The debut in the U.S. was to have been during the National Computer Conference in Houston during June. Exact prices were to have been announced in June with initial shipments scheduled for some time in September. Prices were hinted as being far less than similarly configured personal computers currently available with 64K to 128K of memory.

The first system is a full color, 40-column system with 128K bytes of RAM. The second is an 80-column system with attached video monitor, 128K of RAM and built-in dual floppy disk drives with 340K of storage capacity. Both of these systems are based on a new Commodore microprocessor, the 6509, and will be capable of accepting a Z-80 or 16-bit 8088 microprocessor. This will allow the new systems to use the large base of CP/M software currently available.

The top of the line system is an 80-column, 16-bit multiprocessor system with attached video monitor, 256K of RAM and built-in dual floppy disk drives with 680K of storage capacity. This system includes both the Commodore 6509 and an 8088 16-bit microprocessor.

Caveat

If you're playing around with machine-language programs on an 8032 system, be sure to stay away from hex location 7FFF at the top of RAM memory. Apparently this location is occasionally used with the checksum when you are saving a program to tape with the monitor. Also, the second cassette is not reliable since some of the second cassette variables in low RAM are also used for other functions in the 8016 and 8032.

Quirk

If you have a 2001 series PET and still have the Basic 3.0 ROMs installed, try typing this command and see what you get:

WAIT 6502,10

You should see MICROSOFT BASIC repeated ten times on the display. Newer Basic 4.0 systems do not have this little "feature."

Copy

A help disk is now available for the new edition of the Osborne/McGraw-Hill PET/CBM Guide. It contains a number of useful programs, including a new disk utility by Jim Butterfield to copy files from one disk controller to another. Copies of the disk are being provided by ATUG as well as other user's groups across the country. I can supply copies for the 8050 drive; you can get 4040 copies from Brent Anderson, 200 S. Century, Rantoul, IL 61866. Terms are the same as for all other ATUG disks: \$5 if you supply the disk, mailer and return postage, or \$10 if we take care of everything. If you are sending a disk please be sure to package it properly so it arrives undamaged. □



Introducing a direct line to a 60 MHz Tektronix scope built for your bench!

From the world's most respected name in oscilloscopes: a new scope, plus a new direct order number, that finally makes it practical to put Tektronix quality on your bench...at work or home.

Among professional engineers and technicians there is no substitute for the performance and reliability of Tektronix oscilloscopes.

Now, for the first time, Tektronix is offering an advanced scope at an unprecedented low price—and has a direct order line that lets you get your order processed today!

The scope: the 2213. Its radical new design brings you Tektronix quality for well below what you would pay for

lesser-name scopes.

The 2213's practical design includes 65% fewer mechanical parts, fewer circuit boards, electrical connectors and cabling. Result: a lower price for you plus far greater reliability.

Yet performance is pure Tektronix: there's 60 MHz bandwidth for digital and high-speed analog circuits. The sensitivity for low signal measurements. The sweep speeds for fast logic families. A complete trigger system for digital, analog or video waveforms. And new high-performance Tektronix probes are included!

2213 PERFORMANCE DATA

Bandwidth: Two channels, dc—60 MHz from 10 V/div to 20 mV/div. (50 MHz from

2 mV/div to 10 mV/div).

Sweep speeds: Sweeps from 0.5 s to 50 ns (to 5 ns/div with X10 mag).

Sensitivity: Scale factors from 100 V/div (10X probe) to 2 mV/div (1X probe). Accurate to $\pm 3\%$. Ac or dc coupling.

Delayed sweep measurements: Standard sweep, intensified after delay, and delayed.

(Need dual time-base performance and timing accuracy to $\pm 1.5\%$? Ask about our 2215 priced at \$1400.)

Complete trigger system: Modes include TV field, normal, vertical mode, and automatic; internal, external, and line sources; variable holdoff.

Probes: High perform-

ance, positive attachment, 10-14 pF and 60 MHz at the probe tip.

The price: Just \$1100 complete*. Order direct from Tektronix National Marketing Center. Phones are staffed by technical people to answer your questions about the 2213. Your direct order includes a 15-day return policy and full Tektronix warranty.

Now it's easier than ever to get your hands on a Tek scope!

ORDER TOLL-FREE

800-547-1845

Ask for Department A2127

(In Oregon, Alaska and Hawaii: 1-503-627-5402 collect.) Lines are open from 8 am EST to 5 pm PST.

*Price F.O.B., Beaverton, OR.

Tektronix
COMMITTED TO EXCELLENCE



Business Is Our Business

Gene Cayot, Sales Manager, MSI. . .

We have been building commercial quality computer systems for 11 years now. . . a lot longer than most companies in our industry. Our reputation for quality and reliability has been firmly established in over twenty different countries where MSI Business Systems are sold.

Let me tell you more about MSI and our business systems. . .

*With MSI you get a lot
more than just hardware.*

Technical Support

We offer the finest and most extensive customer support of any company in our industry. Our systems are equipped with modems which permit our technical support staff to perform system diagnostics and file maintenance remotely via telephone lines. Our company aircraft allows support personnel to be at the customer's site within a few hours if necessary.

Expandability

Our systems do not have built-in obsolescence. Any MSI computer system can be expanded to run in multi-user mode, with large capacity hard disk drives, and with our business software. MSI systems can grow, as your business grows, to meet your needs.

Customer Training

We hold seminars at selected locations around the country which provide training in all areas of MSI system operations — from installation to the use of our business software.

Business Is Our Business

Our business software modules are designed for "real world" business use. We offer complete audit trail files for all changes to the data base, complete history files, and general ledger posting files. Back-up routines provide maximum protection of the data files on removable disk cartridges.

Let MSI help your business run better

If you have a problem in inventory control, bills of material, order entry/accounts receivable, general ledger, or cost accounting — give me a call personally for more information on an MSI Business System.

MSI **Midwest Scientific Instruments**

220 West Cedar • Olathe, Kansas 66061

913-764-3273

TWX 910 749 6403 • TELEX 437049

Bulletin Boards Continue to Hum

Make Inroads Against Big Info Utilities

I started this column two and one-half years ago to discuss electronic message systems and methods of dialing them up using a microcomputer as a communications device. Since that time we have wandered all over the landscape looking at information utilities, alternative telephone services, a lot of different hardware and a seemingly endless pile of software. This month, we will circle around and go back to where we started, back to electronic message systems, to see what the status of the phenomenon is now. But first, let's look back over the path we have travelled.

Let's begin by defining a few terms. Electronic message system (EMS) is a generic term for a microcomputer that contains a database that can be accessed by people (or machines) calling in over telephone lines. The database normally contains messages posted by individual users and addressed either to specific people or for the general interest of all users. The database may also contain programs to run or other features such as special-interest conferences and program exchanges.

The systems include an automatic answering modem which translates between the direct-current digital signals of the computer and the analog audio signals of the telephone system. The modem answers the phone when it rings and allows the system to operate without human attendance.

Aside from those broad statements, it is not easy to generalize about electronic message systems. Some are running on simple computers with 48K of RAM and no disk drives, while others are on mini-computers with 40 megabytes of hard-disk storage. Some are run by charitable individuals, others by major corporations. Some systems are run for the general interest of anyone who might call in, while others specialize in genealogy, medical in-

Table. List of active electronic message systems (courtesy of Bill Blue).

Compliments of Peoples' Message System, Santee CA.
(7 1 4) 5 6 1 - 7 2 7 7

*24 denotes 24-hour operation
#1 denotes original system of that type
-rb denotes call, let ring once and call back
-so sexually oriented messages
! new system or new number to existing system
\$ Supports VADIC 1200 baud operation
& Supports 212A 1200 baud operation
% Supports BAUDOT operation

Please send updates/corrections to:

P M S Santee or Source TCB117

ABBS A.C.E.S., Ft. Lauderdale, FL.....	(305)	524	2237
ABBS ABACUS II, Toledo, OH.....	(419)	865	1594
ABBS ACG-NJ, NJ.....	(201)	753	1225
ABBS ABSS, Dallas, TX.....	(214)	661	2969*24
ABBS AGS, Atlanta, GA.....	(404)	733	3461*24
ABBS AIMS, Oak Brook IL.....	(312)	789	0499*24
ABBS Akron Digital Group, Akron, OH.....	(216)	745	7855*24
ABBS Ames, IA.....	(515)	294	8204
ABBS Apple Cider, Las Vegas, NV.....	(702)	454	3417
ABBS Apple Crate I, Seattle, WA.....	(206)	935	9119
ABBS Apple Crate II, Seattle, WA.....	(206)	244	5438
ABBS Apple Group N.J., Piscataway, NJ.....	(201)	968	1074
ABBS Apple-Med, Iowa City, IA.....	(319)	353	6528
ABBS Austin, TX.....	(512)	261	6860
ABBS Baileys Computer Store, Augusta, GA.....	(404)	790	8614
ABBS Baton Rouge, LA.....	(504)	291	1360
ABBS Boston, MA.....	(617)	354	4682
ABBS Bowling Green, OH.....	(419)	352	4477
ABBS Byte Shop, Ft. Lauderdale, FL.....	(305)	486	2983
ABBS Byte Shop, Miami, FL.....	(305)	261	3639
ABBS CCNJ, Pompton Plains, NJ.....	(201)	835	7228
ABBS Century Next Computers, St. Louis, MO....	(314)	442	6502
ABBS Cleveland, OH.....	(216)	779	1338
ABBS CODE, Glen Ellyn IL.....	(312)	537	7063*24
ABBS Compumart, Ottawa, Ontario, Canada.....	(613)	725	2243
ABBS Computerland, Fremont, CA.....	(415)	794	9314
ABBS Computer Corner, Amarillo, TX.....	(806)	355	5610
ABBS Computer Crossroads, Columbia, MD.....	(301)	730	0922
ABBS Computer Forum, Sante Fe Springs, CA.....	(213)	921	2111
ABBS Computer Lab, Memphis, TN.....	(901)	761	4743
ABBS Computer Room, Kalamazoo, MI.....	(616)	382	0101
ABBS Computer Store, Toledo, OH.....	(419)	531	3845
ABBS Computerland, Jackson, MS.....	(601)	362	8755
ABBS Craig, Los Angeles, CA.....	(213)	345	3670
ABBS CTI, New York, NY.....	(212)	799	9577
ABBS Dallas Info Board.....	(214)	248	4539

Address correspondence to Frank J. Derfler, Jr., PO Box 691, Herndon, VA 22070.

More →

COMMUNICATE!

"The Professional" Series from SDS

NEW Apple II terminal software

- Z-Term "The Professional"™ by Bill Blue, for Apple CP/M*
- P-Term "The Professional"™ by Joel Kunin and Bill Blue, for Apple Pascal**
- ASCII Express "The Professional"™ by Mark Robbins and Bill Blue, for Apple DOS**

Businessmen

- Q. Do you have difficulty operating your printer when connected to a time-sharing computer? Are files you're trying to download too large for your system buffer? Does your host computer lose data when you send files to it?
- A. "The Professionals" incorporate printer ring buffers which allow slower printers to accept data at their own rates. Very large files are easily received by periodically saving the buffer to disk. Unlike some software which can lose data during disk saves, "The Professionals" not only direct the host to stop, but actually wait for it to respond before performing the save. After a successful save, the host is automatically directed to continue. This process may be repeated indefinitely. Lost data during send is virtually eliminated by the widest variety of send options available in any communications software. "The Professionals" ensure fast, reliable data transfer of any valuable business information.

Authors

- Q. Does your line of work involve sending written material to others? Are you a program author who would like to send work in progress to a partner or client and know that it arrived intact? What would the ability to instantly send material or programs to anyone at any time be worth to you?
- A. "The Professionals" provide the ideal way to send your articles, manuscripts, reports, programs and technical documents to another computer with phone line access. Now you can work WHEREVER you want, and be assured that your data is sent to its destination quickly and error-free. In fact, compared to the fastest mail services, "The Professionals" offer immediate delivery and will save you the purchase price in just a few uses.

Students

- Q. Are you bothered by limited access to your school's existing terminals? Would you like to be able to do your school assignments at home at your own convenience?
- A. "The Professionals" allow you to access virtually any dial-up school or college computer system over standard telephone lines. This means no more waiting in line for an available terminal or hassles with malfunctioning school equipment. You can even prepare term papers or reports while off-line and send the completed work to the school computer for final printing. Best of all, you can work from home at the times most convenient for you.

Time Share Users

- Q. Are you tired of wasting time and money sending or receiving files with inadequate, poorly designed software? Do you find yourself manually performing the same lengthy log-in procedures over and over again? Would you like to automate these procedures for yourself and others?
- A. "The Professionals" allow you to send files which have been prepared in advance. They may then be transferred at any time, as quickly as possible — even to several different systems. No time is wasted reviewing information while on line; data may be captured by your computer or printer (or both) to be evaluated later at your convenience. These features assure minimum on-line time and therefore minimum on-line cost.

"The Professionals" introduce macros that are more sophisticated than anything previously seen in communications software. These "hand-shaking" macros allow you to perform complete multi-stage log-on sequences automatically; all you do is specify the system to be called. This eliminates sign-on errors and greatly simplifies operation of the entire system, not only for you, but for other less skilled operators.

Bulletin Boards

- Q. Would you like to be able to take advantage of the information featured on local bulletin boards and information services such as The Source, CompuServe, Dow Jones, and others?
- A. "The Professionals" open the world of modem communication networks to you. There are already thousands of these systems and networks in use nationwide. "The Professionals" provide an ideal way of accessing these systems. All 80 column boards, external terminals (even the 40 column screen), and currently available communications devices are fully supported, including the Hayes Micromodem II and Novation Apple CAT. All standard baud rates — 110, 300, 1200 and others — are fully supported; BAUDOT too, if your computer is equipped with the Apple CAT modem.

Clubs

- Q. Are there other Apple owners with whom you would like to exchange programs or files, but have been unable to do so because of limitations imposed by the software you now use?
- A. Any two Apples equipped with "The Professionals" can transfer ANY type or size file with complete error checking and correction. All of "The Professional" packages are fully conversant with each other and operate almost identically. For the first time ever, you can transfer compatible files to an operating system different from yours — error free!

"The Professional" Series - Excellence in Apple Communications Software

SDS southwestern
data systems™

*CP/M is a trademark of Digital Research.

**Apple is a trademark of Apple Computers, Inc.

P.O. Box 582-K Santee, CA 92071 714-562-3670

formation, investments or subjects that are for adults only.

The Pioneers

Ward Christensen and Randy Sueß are widely acknowledged as having started the first successful electronic message system in Chicago in early 1979. Their original goal was to exchange messages with members of their local computer club, in much the same way that they posted notes on a cork bulletin board. They called their system a computer bulletin board system or CBBS.

CBBS served as a generic term for a while, until Ward and Randy protected it with a copyright and directed that it should apply only to systems running with their software. The CBBS software is designed to be run on an S-100 bus system using Digital Research's CP/M operating system.

The popular Apple II computer was not far behind. Craig Vaughan and Bill Blue collaborated in California to develop the first successful Apple Bulletin Board System or ABBS. They later separated, with Bill developing the Peoples' Message System Software and Craig continuing on with significant improvements to the ABBS software.

Dennis Hayes, Glenn Sirkis and Dale Heatherington developed a multifunction modem device for S-100 and Apple II com-

Table continued.

ABBS Denver, CO.....	(303)	759	2625
ABBS Desert Technology, Phoenix, AZ.....	(602)	957	4428*24
ABBS Detroit, MI.....	(313)	477	4471
ABBS Downers Grove, IL.....	(312)	964	7768
ABBS El Paso, TX.....	(915)	533	6255
ABBS El Paso, TX.....	(915)	533	7039
ABBS Electro-Mart, Spokane, WA.....	(509)	534	2419*24
ABBS Fort Walton Beach, Destin, FL.....	(904)	243	1257
ABBS Gamemaster, Chicago, IL.....	(312)	475	4884*24
ABBS Hayward, CA.....	(415)	881	5662
ABBS Illini Microcomputer, Naperville, IL.....	(312)	420	7995
ABBS Ketchikan, AK.....	(907)	225	6789
ABBS Lafayette, CA.....	(415)	284	9524
ABBS Lincoln, NE.....	(402)	423	8086*24
ABBS Long Beach, CA.....	! (213)	422	2704
ABBS Louisville, KY.....	(502)	245	7811*24
ABBS McGraw-Hill, New York, NY.....	(212)	997	2186
ABBS Medical, Grand Forks, ND.....	(701)	777	4380
ABBS Memphis, TN.....	(901)	725	5691
ABBS Michigan Apple-Fone, Southfield, MI.....	(313)	357	1422
ABBS NJAUC, Marlton, NJ.....	(609)	983	5970
ABBS Oak Brook Computer, Oak Brook, IL.....	(312)	941	9009
ABBS Omaha, NE.....	! (402)	339	7809
ABBS PCnet, San Francisco, CA.....	(415)	863	4703*24
ABBS Pacific Palisades, Los Angeles, CA.....	(213)	459	6400
ABBS Peoria, IL.....	(309)	692	6502
ABBS Phoenix, AZ.....	(602)	898	0891
ABBS Pirates Cove, Long Island, NY.....	(516)	698	4008
ABBS Portland, OR.....	(503)	641	8555*24
ABBS Rainbow Computing, Los Angeles, CA.....	(213)	349	5728
ABBS Rogers Park, Chicago, IL.....	(312)	973	2227
ABBS Saddlebrook, NJ.....	(201)	843	4563
ABBS San Antonio, TX.....	(512)	737	0214*24
ABBS Seattle, WA.....	(206)	248	2600
ABBS Software Sorcery, Washington, DC.....	(703)	255	2192

More

Circle 188 on Reader Service card.

Circle 116 on Reader Service card.

DAISY WHEEL

By SMITH-CORONA

SAVE \$500⁰⁰

...and more over all other popular Daisy Wheel Printers.

- 120 WORDS PER MINUTE • FRICTION FEED
- CHANGEABLE DAISY WHEEL TYPE FONTS
- CENTRONICS PARALLEL or RS232 INTERFACE

You Pay Only \$745⁰⁰

TOLL-FREE
ORDERS ONLY

800-257-6170

in New Jersey
609-428-3900



Rainbow™

TM

P & P CORPORATION
P.O. BOX 362 • HADDONFIELD, N.J. 08033

IBM — XEROX — TRS-80 — CBM
HEWLETT-PACKARD — NORTHSTAR
DEC — HEATH — ZENITH — PMC
OSBORNE — OSI — INTERTEC . . .

WE HAVE



THE CONNECTION

Connect your IBM Selectric®,
IBM Electronic, or Olivetti
typewriter to any Microcomputer.

**UNDER
\$600**



ESCON Products, Inc.
12919 Alcosta Blvd.
San Ramon, Ca., 94583
(800) 227-2148 (415) 820-1256



TAKE THE 3-VOLUME PERSONAL COMPUTING LIBRARY FOR ONLY \$2.95

when you join **THE LIBRARY OF COMPUTER AND INFORMATION SCIENCES**
You simply agree to buy 3 more books—at handsome discounts—within the next 12 months.

Enjoy the challenge and reap the benefits of microcomputing with the Personal Computing Library. This set of three carefully-selected books—a \$57.45 value—provides you with hours of thought-provoking computer projects. For only \$2.95—it's a value you can't afford to pass up.

Take a look at the three books you'll get!

MICROPROCESSORS AND MICROCOMPUTER SYSTEMS.

Second Edition. Guthikonda V. Rao. A comprehensive guide to the latest developments in microcomputer technology, including LSI/VLSI microcomputers and microprocessors, and their current applications, plus hardware, software, and firmware. Numerous reference charts and illustrations. Wide ranging coverage includes: various off the shelf chips, personal computing, video games, small business programs, display system data. Nearly 600 pages of information.

Publisher's Price \$36.50

CIARCIA'S CIRCUIT CELLAR: Volumes I and II.

The two softbound volumes provide... a complete tutorial to the construction of over 30 microcomputer projects.

Volume I includes:

- how to build a dual voltage converter, and various methods to help you achieve voltage multiplication
- classical I/O decoding and memory mapped methods
- how to construct an 8 channel 3½ digit DC digital voltmeter interface

Volume II includes:

- how to build a computer controlled security system for your home

- a design for a computer controlled wood stove
- how to add nonvolatile memory to your computer

Publisher's Price \$20.95.

The Library of Computer and Information Sciences is the oldest and largest book club especially designed for the computer professional. In the incredibly fast-moving world of data processing, where up-

to-date knowledge is essential, we make it easy for you to keep totally informed on all areas of the information sciences. In addition, books are offered at discounts up to 30% off publishers' prices.

Begin enjoying the club's benefits today!

4 Good Reasons to Join

1. The Finest Books. Of the hundreds of books submitted to us each year, only the very finest are selected and offered. Moreover, our books are always of equal quality to publishers' editions, never economy editions.

2. Big Savings. In addition to getting the Personal Computing Library for \$2.95 when you join, you keep saving substantially—up to 30% and occasionally even more. (For example, your total savings as a trial member—including this introductory offer—can easily be over 50%. That's like getting every other book free!)

3. Bonus Books. Also, you will immediately become eligible to participate in our Bonus Book Plan, with savings up to 70% off the publishers' prices.

4. Convenient Service. At 3-4 week intervals (16 times per year) you will receive the Book Club News, describing the Main Selection and Alternate Selections, together with a dated reply card. If you want the Main Selection do nothing and it will be sent to you automatically. If you prefer another selection, or no book at all, simply indicate your choice on the card, and return it by the date specified. You will have at least 10 days to decide. If, because of late mail delivery of the News, you should receive a book you do not want, we guarantee return postage.

The Library of Computer and Information Sciences

Riverside, N.J. 08075

Please accept my application for trial membership and send me the Personal Computing Library B (10522) for \$2.95. I agree to purchase at least three additional Selections or Alternates over the next 12 months. Savings range up to 30% and occasionally even more. My membership is cancelable any time after I buy these three books. A shipping and handling charge is added to all shipments.

No-Risk Guarantee: If you are not satisfied—for any reason—you may return the Personal Computing Library within 10 days and your membership will be canceled and you will owe nothing.

Name _____

Name of Firm _____
(if you want subscription sent to your office)

Address _____ Apt. _____

City _____ State _____ Zip _____

(Offer good in Continental U.S. and Canada only. Prices slightly higher in Canada.)

Kilobaud _____ 7-BC8 _____

Table continued.

ABBS South of Market, San Francisco, CA.....	(415)	469	8111-so
ABBS Spokane, WA.....	(509)	456	8900
ABBS St. Louis, MO.....	(314)	838	7784*24
ABBS Stones, Los Angeles, CA.....	(213)	859	0894
ABBS The Moon, Dallas, TX.....	(214)	931	3437*24
ABBS Turnersville, NJ.....	(609)	228	1149
ABBS Vancouver, B.C.....	(604)	437	7001
ABBS Vermont, Essex Junction, VT.....	(802)	879	4981*24
ABBS VIBBS, Nashua, NH.....	!(603)	888	6648
ABBS West Palm Beach, FL.....	(305)	689	3234
ABBS Rob Roy Computer, Yakima, WA.....	(509)	575	7704
ABBS Youngs Elect Svc., College Station, TX...	(713)	693	3462*24
ABBS #X, Atlanta, GA.....	(404)	256	1549
ABC Vancouver, B.C.....	!(604)	682	6551
A-C-C-E-S-S Annapolis, MD.....	(301)	267	7666
A-C-C-E-S-S Phoenix, AZ.....	#1 (602)	996	9709*24
A-C-C-E-S-S Phoenix, AZ.....	(602)	957	4428
A-C-C-E-S-S Scottsdale, AZ.....	(602)	998	9411
A-C-C-E-S-S Wyckoff, NJ.....	(201)	891	7441
ALPHA Tampa, FL.. acct#=ABCD00, pwd=TRYIT	(813)	251	4095*24
ARBB Seattle, WA.....	(206)	546	6239
ATARI BB.....	(416)	533	9216
Aviators Bulletin Board, Sacramento, CA.....	(916)	393	4459
Baton Rouge Data System, Baton Rouge, LA.....	(504)	926	0181
BBS B.R., Los Angeles, CA.....	!(213)	394	5950*24
BBS Pensacola, FL.....	(904)	477	8783
BBS Electronic Exchange, Chicago, IL.....	(312)	541	6470*24
BBS Living Videotext, Menlo Park, CA.....	(415)	327	8876*24

More →

puters called the D.C. Hayes Micromodem. Don Brown at Potomac Micro Magic, Inc., also made a significant contribution with the development of his high-quality PMMI modem board. (Mr. Brown died on December 15, 1981. His son is continuing the operation of the company.) These integrated modem devices functioned without a serial port and provided some very useful capabilities such as auto-answer and auto-dial.

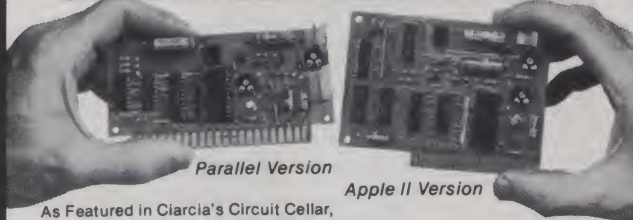
Ward Christensen accepted the challenge of integrating these modem devices with the S-100 bus microcomputers running under CP/M, and wrote the widely-used Modem program which he placed in the public domain. This program has gone through at least seven major revisions. Modem introduced the Christensen protocol, which has become a *de facto* standard for the performance of error detection and retransmission during file transfer.

Other early smart terminal programs include Clink written by Larry Hughes, Telestar by Leonard Garcia and the ST80 series (continually updated) by Lance Micklus.

The popularity of microcomputer data communications was given a big boost by the aggressive marketing of the Cat modem by Novation. Cats were available under several manufacturers' labels, and provided reliable and simple operation at a reasonable price.

Circle 347 on Reader Service card.

SWEET-TALKER, IT GIVES YOUR COMPUTER AN UNLIMITED VOCABULARY.



As Featured in Ciarcia's Circuit Cellar,
Byte Magazine, September 1981.

The Sweet-Talker voice synthesizer allows you to add speech of unlimited vocabulary to your computer. Utilizing the Votrax SC-01A chip, you can output any message by programming individual phonemes. Comes in two versions; one plugs directly into your Apple II, the other connects to any computer with an 8-bit parallel printer port. + 12 volts and + 5 volts required for parallel board.

- | | | | |
|---|-------|--|------------|
| • Contains 64 different phonemes accessed by a 6-bit code. | ST01 | Sweet Talker Parallel Port Board A & T..... | \$139.00 |
| • Automatic and manual inflection modes. | ST02 | Sweet Talker Apple II plug in board..... | 149.00 |
| • Parallel port driven or plug-in compatible with Apple II. | ST06 | Text-to-Speech algorithm on disk for Apple II..... | 35.00 |
| • Super text-to-speech algorithm on disk for Apple II. Makes Sweet-Talker equivalent to units 3 times the cost. | SC01A | Votrax Speech Synthesizer chip..... | 70.00 |
| • On board audio amplifier | | 5 or more..... | 55.00 each |
| • Sample program on cassette with Apple II board. | UPS01 | Universal Power Supply A & T..... | 35.00 |
| • Optional power supply for parallel board. | | Add \$2.00 for shipping & handling. | |

To Order: Call Toll Free 1-800-645-3479
(In N.Y. State Call: 1-516-374-6793)
For Information Call: 1-516-374-6793

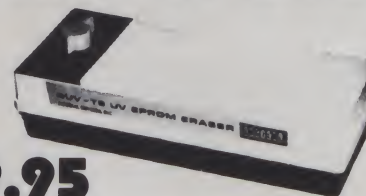


MICROMINT INC.
917 Midway
Woodmere N.Y. 11598



Circle 373 on Reader Service card.

UV EPROM ERASER



\$49.95

- ERASES ALL UV ERASABLE EPROMS (2708, 2716, 2564, etc.)
- QUICK FIFTEEN MINUTES ERASE TIME
- ERASES OVER FIFTEEN EPROMS AT A TIME
- LAMP LIFE, 7700 HOURS
- INDUSTRIAL MODEL \$68.50.
- INDUSTRIAL MODEL WITH TIMER & SAFETY INTERLOCK SWITCH \$97.50.
(Rugged steel enclosure with bottom drawer)

THE BEST 6809 SINGLE BOARD COMPUTER AVAILABLE

- | | |
|---------------------|----------------------|
| • Floppy Controller | • SWTPC compatible |
| • Printer Port | • Runs TSC Flex |
| • RS-232 Port | • Full Documentation |

PRICE: **\$389.00**

FOR THE SS-50 AND S-100 BUS

ASSEMBLED, TESTED, 48 HOUR BURN-IN, 90 DAY WARRANTY

2716 EPROMS 450 ns **\$4.95** DIRECT FROM FACTORY

SS-50 6809 CPU CARD: 1MHZ \$149.00 2MHZ \$189.00

RS-232 INTELLIGENT EPROM PROGRAMMER \$489.00
Programs: 2716, 2516, 2532, 2732, 8748, 8749

ANTISTATIC FOAM 4" x 8"..... **\$3.95**

WE ACCEPT VISA, MASTERCARD, C.O.D., CHECKS

PHONE ORDERS (305) 776-5870

TWX: 510-955-9496 • Engineering Hot-Line: (305) 974-0967

LOGICAL DEVICES INC.

781 W. OAKLAND PARK BLVD. • FT. LAUDERDALE, FLORIDA 33311

ADD: \$3.00 SHIPPING, \$2.00 C.O.D. CHARGES

The next significant advances came in the quality of the software. If the microcomputer data communications phenomenon was to grow, the software had to become easier to install and use. Programs such as Omniterm by David Lindbergh, ASCII Express by Bill Blue and Crosstalk by Les Freed began to fill this need.

Bill Abney's development and distribution of the Forum 80 software was another milestone. This network was one of the first to include the ability to exchange programs and it provided additional motivation for many people to try data communications.

Also, around the beginning of 1980, a guy named Derfler started writing a column explaining modems, programs and the paraphernalia of data communications in *Kilobaud Microcomputing*. I have been told that this column encouraged many people to "get on the air."

At about the mid-point of 1980 I started writing my book, *Microcomputer Data Communications Systems*, which was released at the end of 1981. I hope that it too will serve as a marker on the road to successful communications for many people.

The folks down at Hayes (now renamed Hayes Microcomputer Products) set another milestone when they released the Hayes Stack SmartModem. This device

Table continued.

BBS-80 Cincinnati, OH.....	(513)	244	2983
BBS-80 DALTRUG, Dallas, TX.....	(214)	235	8784*24
BSBB Tampa, FL.....	(813)	885	6187*24
BULLET-80 Akron, OH.....	(216)	645	0827*24
BULLET-80 Chesterland, OH.....	(216)	729	2769
BULLET-80 Clarks Summit, PA.....	(717)	586	2112
BULLET-80 Danbury, CT.....	#1 (203)	744	4644
BULLET-80 Fayetteville, GA.....	(404)	461	9686
BULLET-80 Hawkins, TX.....	(214)	769	3036
BULLET-80 Houston, TX.....	(713)	331	2599
BULLET-80 Ironton, OH.....	(614)	532	6920
BULLET-80 Langhorne, PA.....	(215)	364	2180
BULLET-80 Littlefield, TX.....	(806)	385	6843
BULLET-80 Mt. Clemens, MI.....	(313)	465	9531
BULLET-80 Riverside, CA.....	(714)	359	3189
BULLET-80 San Jose, CA.....	(408)	241	0769
BULLET-80 Springfield, IL.....	(217)	529	1113
BULLET-80 Tyler, TX.....	(214)	595	4217
Bronx BBS, NY.....	(212)	933	9459
C-HUG Bulletin Board, Fairfax, VA.....	(703)	360	3812*24
Capital City BBS, Albany, NY.....	(518)	346	3596*24
CBBS AMRAD, Washington, DC.....	(703)	734	1387*24
CBBS Atlanta, GA.....	(404)	394	4220*24
CBBS Baton Rouge, LA.....	(504)	273	3116*24
CBBS Bloomington, IN.....	(812)	334	2522
CBBS Boston, MA.....	(617)	646	3610*24
CBBS Cedar Rapids, IA.....	(319)	364	0811
CBBS Chicago, IL.....	#1 (312)	545	8086*24
CBBS Corpus Christi, TX.....	(512)	855	1512
CBBS Detroit, MI.....	(313)	288	0335*24

More →

Circle 211 on Reader Service card.

OHIO SCIENTIFIC USERS! PERFORMANCE SOFTWARE

GENERAL BENEFITS PACKAGES FOR ALL 65U USERS
(V1.1 & V1.2)

RIDICULOUSLY AFFORDABLE

SEND FOR OUR FREE CATALOG

EXTEND YOUR EXISTING BASIC PROGRAMS TO:

increase io throughput between 20 - 200% - IOPAK
improve string performance, minimize garbage collection - STRINGPAK
output formatting statements - FORMATPAK
sort 1000 items in 10 seconds (on a 1 meg clock) - SORTPAK
device #8 modem program with output to printer - MODEMP
... and more

TRY OUR POTPOURRIK - INTRODUCTORY OFFER - \$30

WE ALSO OFFER

BASIC LANGUAGE EXTENSION CUSTOM SERVICE

(ALMOST) ANY STATEMENT IMAGINABLE IS POSSIBLE
(65U only)

CUSTOMIZE YOUR BASIC! WE CAN CONFIGURE YOUR PROGRAMMING LANGUAGE TO SUIT YOUR APPLICATION NEEDS. SELECT YOUR OWN COMBINATION OF STATEMENTS FROM OUR CATALOG. ASK US TO WRITE NEW ONES FOR YOU. LET US CONVERT YOUR ASSEMBLY ROUTINES TO BASIC STATEMENTS.

WITH OUR SOFTWARE YOU CAN
SUPERCHARGE YOUR EXISTING
PROGRAMS AND START YOUR NEW
ONES ON AFTERBURNER.

According to Funk & Wagnalls 1971 edition:
SUPERCHARGE - (sco-per-char) v1.1 To adapt (an engine)
to develop more power, as by fitting
with a supercharger.

AFTERBURNER - (at-ter-bur-ner) n. Aeron. A device for
injecting extra fuel into the exhaust
system of a jet engine as a means
of increasing the thrust.

Do yourself a favor
and send your request
for a catalog to:

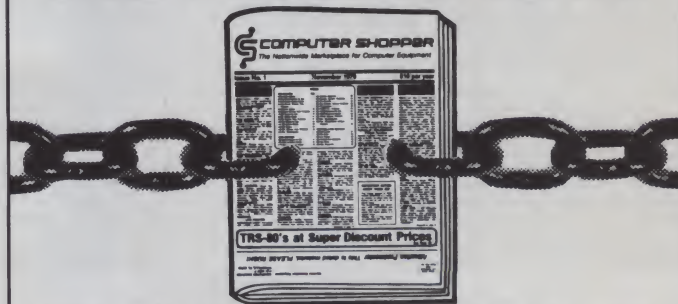
Bartleby's Software Service, Inc.
G.P.O. Box 1665
New York, N.Y. 10116

P.S. Complete and lucid documentation
provided, of course.

"The Software Services"

Circle 36 on Reader Service card.

YOU'VE JUST FOUND THE MISSING LINK!



Computer Shopper is your link to individuals who buy, sell and trade computer equipment and software among themselves nationwide. No other magazine fills this void in the marketplace chain.

Thousands of cost-conscious computer enthusiasts save by shopping in Computer Shopper every month through hundreds of classified ads. And new equipment advertisers offer some of the lowest prices in the nation.

Computer Shopper's unbiased articles make for some unique reading among magazines and there's a "help" column to answer difficult problems you may have with interfacing, etc.

For a limited time you can subscribe to Computer Shopper with a six month trial for only \$6.

6 month trial, \$6⁰⁰ Call Toll Free **800-327-9920**

or send
check to:

COMPUTER SHOPPER

P.O. Box F328 • Titusville, FL 32780
305-269-3211

except Florida, Hawaii, Alaska

DISCOUNT LINE

1-800-528-8960

GUARANTEED LOW PRICES

APPLE CARDS

16K RAM — \$99 Z80 CARD — \$210
Videx Card — \$249 Smart Term — \$269
Graphic Card — \$89 Clock CARD — \$120

ALTOS

8000-2 — \$2675 8000-15 — \$3850

ANADIX

9500 — \$1200 9501 — \$1200

ATARI

400-16K — \$399 800-16K — \$659
410 — \$79 810 — \$429
825 — \$569 850 — \$167

C-IOTH

F-10P — \$1380 F-10S — \$1525

DATASOUTH

DS120 — \$595 DS180 — \$1259

DIABLO

630RO — \$1945 630KSR — \$2475

DISKETTES/BOXES

Elephant — \$20 Scotch — \$25 Dysan — \$35

EPSON WITH GRAPHICS

MX70 — \$289 MX80 — \$429
MX80FT — \$519 MX100 — \$689
GRAPHIC ROM — \$69 RS232 — \$69

HAZELTINE

1500 — \$995 ESPRIT — \$595

LOBO

Apple Drive/Card — \$350/\$50

MODEMS

HAYS — MICROMODEM — \$290
HAYS — SMARTMODEM — \$229
Penril — 300/1200 (212A) — \$795

MONITORS

Teco-BW — \$99 Teco-Green — \$115
Sanyo-Green — \$249 Color — \$425
Amdek-Green — \$159 Color — \$349

NORTHSTAR

Advantage — \$2995 HR64QD — \$3025

NEC

8023 — \$489 7710 — \$2350

MPI

88G — \$550 99G — \$650

SOROC

120 — \$659 135 — \$689

TELEVIDEO

912 — \$669 950 — \$915

TI

810 — \$1240 820 — \$1795

SOFTWARE

All Major Brands — \$CALL

MOUNTAIN HARDWARE

CPS Card — \$169 Music System — \$429

OKIDATA

M80 — \$320 SL125 — \$3150
M82A — \$450 SL250 — \$4200
M83A — \$699 M84 — \$1059

XEROX

820 — \$2399

ZENITH

Z19 — \$669 Z89 — \$2129

All Prices Subject To Change

EXPOTEK

2723 W. Windrose • Suite 3
Phoenix, Arizona 85029

Table continued.

CBBS Lambda, Berkeley, CA.....	(415)	658	2919-so
CBBS Lawrence General Hospital, Boston, MA....	(617)	683	2119
CBBS LICA LIMBS, Long Island, NY.....	(516)	561	6590*24
CBBS London, England..(European standard)...	(044)	1	399 2136
CBBS Long Island, NY.....	(516)	334	3134*24
CBBS NW, Portland, OR.....	(503)	646	5510*24
CBBS PACC, Pittsburgh, PA.....	(412)	822	7176*24
CBBS Prince George, B.C., Canada.....	(604)	562	9515
CBBS Proxima, Berkeley, CA.....	(415)	357	1130
CBBS RAMS, Rochester, NY.....	(716)	244	9531
CBBS Richfield, MN.....	(612)	869	5780
CBBS Sunnyvale, CA.....	(408)	737	7543
CBBS TSG, Tucson, AZ.....	(602)	746	3956*24
CBBS Vancouver, BC, Canada.....	(604)	687	2640*24
CBBS Waco, TX.....	(817)	776	1375

CMS-80 Fort Lauderdale, FL.....(305) 462 8677

COMM-80 Orange County, Fullerton, CA.....(714) 526 3687

COMM-80 Queens, NY.....(212) 897 3392*24

Communique-80, Livingston, NJ.....\$(201) 992 4847-so

Compusystems, Columbia, SC.....(803) 771 0922

Computer Arts Message System, Newhall, CA.....(805) 255 6445

CONNECTION-80 Centereach, NY.....(516) 588 5836

CONNECTION-80 Denver, CO.....(303) 690 4566*24

CONNECTION-80 Escondido, CA.....(714) 746 6265

CONNECTION-80 Fremont, CA.....(415) 651 4147*24

CONNECTION-80 Gaithersburg, MD.....(301) 840 8588*24

CONNECTION-80 Great Neck, NY.....(516) 482 8491*24

CONNECTION-80 Lansing, MI.....(517) 339 3367

CONNECTION-80 Little Rock, AS.....(501) 372 0576

CONNECTION-80 Manhattan, NY.....(212) 991 1664

CONNECTION-80 Orlando, FL.....(305) 644 8327*24

CONNECTION-80 PAUG, Portland, OR.....(503) 928 0301*24

CONNECTION-80 Peterborough, NH.....(603) 924 7920

CONNECTION-80 W. Mich. Micro Group, MI.....(616) 457 1840*24

CONNECTION-80 Winter Garden, FL.....(305) 877 2829*24

CONNECTION-80 Woodhaven, NY.....(212) 441 3755*24

CONFERENCE-TREE #1, Berkeley, CA.....(415) 526 7733

CONFERENCE-TREE #2, San Francisco, CA.....(415) 928 0641

CONFERENCE-TREE #3, Hayward, CA.....(415) 538 3580

CONFERENCE-TREE Anchorage, AK.....(907) 344 5251

CONFERENCE-TREE Minneapolis, MN.....(612) 227 0307

CONFERENCE-TREE Santa Monica, CA.....(213) 394 1505

CONFERENCE-TREE Victoria, TX.....(512) 578 5833

CoxCo, Arvada, CO.....(303) 423 5001*24

EXPERIMENTAL-80 Kansas City, MO.....(913) 676 3613

FORUM-80 Albany, NY.....(518) 785 8478

FORUM-80 Augusta, GA.....(803) 279 5392

FORUM-80 Charleston, SC.....(803) 552 1612*24

FORUM-80 Cleveland, OH.....(216) 486 4176

FORUM-80 #1, Denver, CO.....(303) 341 0636*24

FORUM-80 #2, Denver, CO.....(303) 399 8858

FORUM-80 El Paso, TX.....(915) 755 1000*24

FORUM-80 Family Historians, Fairfax, VA.....(703) 978 7561

FORUM-80 Ft. Lauderdale, FL.....(305) 772 4444*24

FORUM-80 Hull, England.....(011) 44 482 859169

FORUM-80 Kansas City, MO.....#1 & (816) 861 7040*24

FORUM-80 Kansas City, MO.....& (816) 931 9316

FORUM-80 Las Vegas, NV.....(702) 362 3609*24

FORUM-80 Medford, OR.....(503) 535 6883*24

FORUM-80 Medical, Memphis, TN.....(901) 276 8196*24

FORUM-80 Monmouth, Brielle, NJ.....(201) 528 6623*24

FORUM-80 Montgomery, AL.....(205) 272 5069

FORUM-80 Mt. Clemens, MI.....(313) 465 9531

FORUM-80 Nashua, NH.....(603) 882 5041

FORUM-80 Orange County, Anaheim, CA.....(714) 952 2110

FORUM-80 Pontiac, MI.....(313) 335 8456

FORUM-80 Prince William County, VA.....(703) 670 5881*24

FORUM-80 San Antonio, TX.....(512) 340 6720

More →

NEW FROM D & N MICRO PRODUCTS, INC.



MICRO-80 COMPUTER

Z80A CPU with 4MHz clock and CP/M 2.2 operating system. 64K of low power static RAM. Calendar real time clock. Centronics type parallel printer interface. Serial interface for terminal communications, dip switch baud rates of 150 to 9600. 4" cooling fan with air intake on back of computer and discharge through ventilation in the bottom. No holes on computer top or side for entry of foreign object. Two 8" single or double sided floppy disk drives. IBM single density 3740 format for 243K of storage on each drive. Using double density with 1K sectors 608K of storage is available on a single sided drive or 1.2 meg on a double sided drive. Satin finish extruded

aluminum with vinyl woodgrain decorative finish. 8 slot backplane for expansion. 48 pin buss is compatible with most OSI boards. Uses all standard IBM format CP/M software.

Model 80-1200	\$2995
2 8" single sided drives, 1.2 meg of storage	
Model 80-2400	\$3495
2 8" double sided drives, 2.4 meg of storage	
Option 001	\$ 95
Serial printer port, dip switch baud rate settings	

Software available in IBM single density 8" format.

Microsoft		Digital Research		Micropro	
Basic-80	\$289	PL/1-80	\$459	Wordstar	\$299
Basic Compiler	\$329	Mac	\$ 85	Mail-Merge	\$109
Fortran-80	\$410	Sid	\$ 78	Spellstar	\$175
Cobol-80	\$574	Z-Sid	\$ 95	SuperSort I	\$195
Macro-80	\$175	C Basic-2	\$110	Pascal	
Edit-80	\$105	Tex	\$ 90	Pascal/MT +	\$429
Mu Simp/Mu Math	\$224	DeSpool	\$ 50	Pascal Z	\$349
Mu Lisp-80	\$174	Ashton-Tate		Pascal M	\$355
		dBase II	\$595		

Convert almost any static memory OSI machine to CP/M® with the D & N-80 CPU Board.

Z80A CPU with 4MHz clock. 2716 EPROM with monitor and bootstrap loader. RS-232 serial interface for terminal communications or use as a serial printer interface in a VIDEO system. Disk controller is an Intel 8272 chip to provide single or double density disk format. 243K single density or 608K double density of disk storage on a single sided 8" drive. A double sided drive provides 1.2 meg of storage. DMA used with disk controller to unload CPU during block transfers from the disk drives. Optional Centronics type parallel printer port com-

plete with 10 ft. cable. Optional Real Time Calendar Clock may be set or read using 'CALL' function in high level languages. Power requirements are only 5 volts at 1.4 amps. Available with WORDSTAR for serial terminal systems.

D & N-80	serial	\$695
D & N-80	serial w/Wordstar	\$795
D & N-80	video	\$695
Option 001		\$ 80
	parallel printer and real time calendar clock	



D & N-80 CPU BOARD

OTHER OSI COMPATIBLE HARDWARE

IO-CA10X Serial Printer Port	\$125
Compatible with OS-65U and OS-65D software	
IO-CA9 Parallel Printer Port	\$175
Centronics standard parallel printer interface with 10 ft. flat cable	
BP-580 8 Slot Backplane	\$ 47
Assembled 8 slot backplane for OSI 48 pin buss	
24MEM-CM9	\$380
24MEM-CM9F	\$530
16MEM-CM9	\$300
16MEM-CM9F	\$450
8MEM-CM9	\$210
8MEM-CM9F	\$360
BMEM-CM9F	\$ 50
FL470	\$180
24K memory/floppy controller card supports up to 24K of 2114 memory chips and an OSI type floppy disk controller. Available fully assembled and tested with 8, 16, or 24K of memory, with floppy controller (F). Controller supports 2 drives. Needs separated clock and data inputs. Available Bare (BMEM-CM9F) or controller only (FL-470). Ideal way to upgrade cassette based system	

C1P-EXP Expansion Interface	\$ 65
Expansion for C1P 600 or 610 board to the OSI 48 pin buss. Requires one slot in backplane. Use with BP-580 backplane	
BIO-1600 Bare IO card	\$ 50
Supports 8K of memory, 2 16 bit parallel ports may be used as printer interfaces. 5 RS-232 serial ports, with manual and Molex connectors	
DSK-SW Disk Switch	\$ 29
Extends life of drive and media. Shuts off minifloppy spindle motor when system is not accessing the drive. Complete KIT and manual	

Disk Drives and Cables	
8" Shugart SA801 single sided	\$395
8" Shugart SA851 double sided	\$585
FLC-66ft. cable from D & N or OSI controller to 8" disk drive	\$ 69
5 1/4" MPI B51 with cable, power supply and cabinet	\$450
FLC-5 1/4 8 ft. cable for connection to 5 1/4 drive and D & N or OSI controller, with data separator and disk switch	\$ 75
Okidata Microline Printers	
ML 82A Dot Matrix Printer	\$534
120 CPS, 80/120 columns, 9.5" paper width, friction or pin feed	
ML 83A Same as 82A except	\$895
16" paper width, 132/232 columns with tractor feed	
ML 84 Same as 82A except 200 CPS,	\$1152
16" paper width, 132/232 columns, 2K buffer, dot addressable graphics, with tractor feed	

D & N Micro Products, Inc.
3684 N. Wells St.
Fort Wayne, Ind. 46808
(219) 485-6414



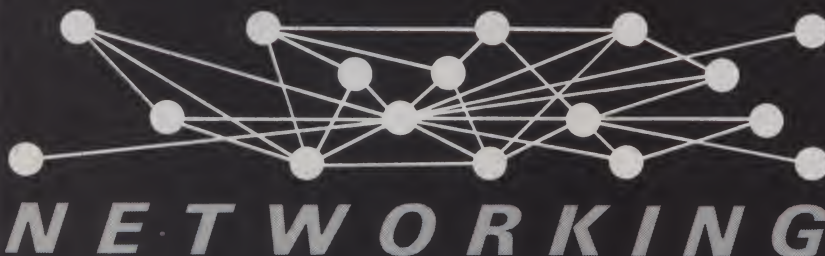
TERMS \$2.50 shipping, Foreign orders add 15%.
Indiana residents add 4% sales tax.

Table continued.

FORUM-80 Seattle, WA.....	(206)	723	3282
FORUM-80 Shreveport, LA.....	(318)	631	7107*24
FORUM-80 Tulsa, OK.....	(918)	747	1310*24
FORUM-80 Union, NJ.....	(201)	688	7117
FORUM-80 Westford, MA.....	(617)	692	3973
FORUM-80 Wichita, KA.....	(316)	682	2113*24
FORUM-80 Wichita Falls, TX.....	(817)	855	3916
HARD-80 Bethel, CT.....	(203)	743	9281*24
HEX Silver Spring, MD.....	%(301)	593	7033*24
HMS Horny Message System, Oakland, CA.....	(415)	845	2079-so
IBM PCUG Annandale, VA.....	(703)	560	0979
JCTS Redmond, WA.....	(206)	883	0403*24
Kinky Kumputer, San Francisco, CA.....	(415)	647	9524-so
L.A. Interchange, Los Angeles, CA.....	(213)	631	3186*24
Lehigh Press BB, PA.....	#1 (215)	435	3388
MAIL BOARD-82 Seattle, WA.....	(206)	527	0897*24
Market 80, Kansas City, MO.....	(816)	931	9316
MARS/RP Rogers Park, IL.....	(312)	743	8176*24
MCMS CAMS, Chicago, IL.....	#1 (312)	927	1020
MCMS Message-82, Chicago, IL.....	(312)	622	4442*24
MICRO-COM Computer City, West Hartford, CT....	(203)	673	9959*24
MIDWEST St. Louis, MO.....	(314)	227	4312-so

More →

Circle 371 on Reader Service card.



If you like to communicate with others, the CompuServe Information Service is your most effective vehicle. Why? Because we have the largest customer base of any videotex system in North America. And we have hundreds of new subscribers each week.

"Talk" to other CompuServe subscribers via CB simulation (it's the most popular offering on our network). Send E-mail, use the electronic bulletin board and exchange information with computer manufacturers, Special Interest Groups and publishers.

Play a variety of networking games with your own group or complete strangers from New York to Chicago to L.A.

Ask for a demonstration at a Radio Shack® Computer Center. Videotex software is available for various brands of personal computers.

CompuServe Information Service, 5000 Arlington Centre Blvd., Columbus, Ohio 43220. (614) 457-8650.

CompuServe

gave any computer or terminal with a serial port the ability to automatically dial and answer the telephone line. No author of terminal software should consider a program complete without the ability to take advantage of the features of a Smart-Modem.

The Current Situation

The best way to examine the current state of electronic message systems is to look at a comprehensive list (see table). The list of systems published in this table is provided through the courtesy of Bill Blue. This is the same list Bill keeps on his Peoples' Message System in Santee, CA. Because of publication lead time, I make no guarantees as to its accuracy, but at least it gives you a good idea of the kinds of systems available. Almost every microcomputer type is shown, and the trend toward special interest systems is apparent.

The systems that are active provide a unique cross-section of the microcomputer industry. Apples and TRS-80s predominate. Commodore and Atari seem under-represented, even though message system software for the PET has been available for a long time.

The growth of systems dedicated mainly to the exchange of CP/M software has been very fast. Many of those RCP/M systems are very sophisticated and pro-

UNIFORTH

FORTH is a highly interactive, extensible language that runs 10-30x faster than interpreted BASIC and in less memory. UNIFORTH adheres to the 1979 FORTH International Standard and is available for any Z-80 and most 16-bit processors using ROM-based I/O and 8" floppy disks. Standard features:

- Stand-alone (no operating system needed)
- Menu-driven cursor-addressed video editor
- Full assembler (manufacturer's mnemonics)
- IEEE-compatible software floating point (with transcendental functions)

Options include: Formatting, DBMS, floating point processor (9512, 8087, 16081) support, terminal emulator, CP/M and RT-11 file transfer, games, printer graphics, Metaforth cross-compiler, etc.

Version 1 UNIFORTH,
no floating point \$ 60
Version 2 UNIFORTH,
with floating point \$ 100
Version 3 UNIFORTH,
f.p. and multitasking \$ CALL

Prices include postage in Continental U.S.
Please write for further details.

UNIFIED SOFTWARE SYSTEMS
P.O. BOX 2644
NEW CARROLLTON, MD 20784
Circle 399 on Reader Service card.

GOSUB International, Inc. presents

The **CARDBOARD** for the VIC 20! The **CARDBOARD** is an expansion motherboard for use with Commodore's VIC 20 series computers. It has six slots that will accept any VIC-compatible cartridge in any configuration.

Increase RAM up to 40K and use several utility ROMs plus have several games online, all switch selectable!

The **CARDBOARD** can be daisy-chained, giving the user an almost unlimited number of available expansion slots.

A system reset switch has also been added to the **CARDBOARD** allowing the user to select and/or restart games on ROM without turning off the computer.

All this for only \$119.95 plus \$1.50 S/H

To order send check or money order to:

GOSUB International, Inc.
501 E. Pawnee, Suite 430
Wichita, Kansas 67211
(316) 265-9858

VISA and MasterCard phone orders also accepted

We Speak

MANX[®]

software systems

Your Language...

introducing:

MANX[®] SOFTWARE SYSTEMS

Aztec C][

C Compiler for Apple][

An outstanding new programming tool.

Now you may write programs in the language of the future for your Apple today.

Aztec C][provides portability, fast program execution, support for all C language features, full IO, library and full standard floating point.

Aztec C][will run on any Apple][with language card and Apple DOS

Manx has an outstanding selection of UNIX compatible C Compilers.

- Aztec C II CP/M \$199
- Aztec C II CP/M for the Apple \$199
(requires Z-80 card, language card and lower case)
- Aztec C][for Apple DOS \$199
- Aztec C II for Zenith HDOS \$199
- Aztec C for CP/M or HDOS \$145
- * C86 for CP/M-86 \$249
- * C86 for IBM PC DOS (MSDOS) \$249
(* by Computer Innovations)

Order today for prompt delivery

MANX[®]

software systems

Box 55, Shrewsbury, N.J. 07701
(201) 780-4004

Mastercard and Visa accepted

**computer
case
company**

**comp
case**
NOW TOLL FREE
800-848-7548

• AP103

• AP101	Apple II with Single Disk Drive	\$109
• AP102	Apple II with Double Disk Drives	119
• AP103	Apple II, 9 inch Monitor & Double Drives ..	129
• AP104	Apple III, two additional Drives & Silentye ..	139
• AP105	12 inch monitor plus accessories	99
• RS201	TRS-80 Model I, Expansion Unit & Drives ..	109
• RS202	TRS-80 Monitor or TV set	84
• RS204	TRS-80 Model III	129
• RS205	Radio Shack Color Computer	89
• AT301	Atari Computer & Accessories	109
• P401	Paper Tiger 440/445/460	99
• P402	Centronics 730/737 Line Printer II/IV	89
• P403	Epson MX70 or MX80	89
• P404	Epson MX100	99
• P405	IDS 560 or Prism Printer	109
• IB501	IBM Personal Computer	129
• IB502	IBM Monitor	99
• CC80	Matching Attaché Case (5")	85
• CC90	Matching Attaché Case (3")	75
• CC91	Matching Accessory Case	95

computer case company

5650 INDIAN MOUND CT. COLUMBUS, OHIO 43213 (614) 868-9464



Table continued.

MINI-BIN Seattle, WA.....	(206)	762	5141-so
MOUSE-NET Nashua, NH.....	(603)	673	9476*24
MSG-80 Everett, WA.....	(206)	334	7394
NET-WORKS Apple Shack, Dallas, TX.....	(214)	644	4781*24
NET-WORKS Big Apple, Miami, FL.....	(305)	948	8000
NET-WORKS C.A.M.S., Decatur, IL.....	(217)	429	5541
NET-WORKS CLAH, Arlington Heights, IL.....	(312)	255	6489
NET-WORKS Coin Games, Los Angeles, CA.....	(213)	336	5535
NET-WORKS Computer Emporium, Des Moines, IA...	(515)	279	8863
NET-WORKS Computer Emporium, San Jose, CA.....	(408)	227	5416
NET-WORKS Computer Pro, Ft. Worth, TX.....	(817)	732	1787
NET-WORKS Computer Station, St. Louis, MO.....	(314)	432	7120
NET-WORKS Computer World, Los Angeles, CA.....	(213)	859	0894*24
NET-WORKS Crescent City, Baton Rouge, LA.....	(504)	454	6688
NET-WORKS Dallas, TX.....	(214)	361	1386*24
NET-WORKS Dayton, OH.....	(513)	223	3672
NET-WORKS El Paso, TX.....	(915)	593	6655
NET-WORKS Encino, CA.....	(213)	345	3670
NET-WORKS Granite City, IL.....	(618)	877	2904
NET-WORKS Lab-Works, Nina, WI.....	(414)	727	3637
NET-WORKS Magnetic Fantasies, Los Angeles, CA.....	(213)	388	5198
NET-WORKS Montreal, Canada.....	(514)	937	2188*24
NET-WORKS Portsmouth, NH.....	(603)	436	3461
NET-WORKS Sparklin' City, Corpus Christi, TX...	(512)	882	6569
NET-WORKS St. Louis, MO.....	(314)	781	1308
NET-WORKS Winesap, Dallas, TX.....	(214)	824	7455
New England Comp. Soc., Maynard, MA.....	(617)	897	0346
New Jersey TELECOM.....	#1 (201)	635	0705*24
Novation CO., Los Angeles, CA.... pass=CAT ...	(213)	881	6880

More

vide a wealth of free software (most of it from the CP/M user's group). As this is being written I know of one bulletin board dedicated to the IBM PC (703-560-0979). By the time this is published I would bet that at least ten will be active.

Another trend in these systems is toward better organization of the material, so the user doesn't have to spend so much time going through long lists of messages. Special interest conferences allow users with shared interests to gather together in one corner of the database while still benefiting from the presence of the whole group. The concept of conferences allows better sharing of the resources while providing support for subgroups who might not be able to justify a dedicated system.

The software controlling these systems has continued to evolve in many ways. The system crashers who used to derive twisted pleasure from entering a system and disabling it have been foiled by some very clever procedures. Many of the systems provide such features as automatic recognition at sign-on, selective message scan and marking, and multiple user access.

The geographical spread of the systems is interesting to examine too. Certainly, California leads in the number and diversity of systems, but some high-quality message systems have been set up to serve various portions of the U.S. and Canada. The Europeans simply don't seem to

Circle 138 on Reader Service card.

Circle 131 on Reader Service card.

FREE!

MICROCOMPUTER IDEA BOOK & CATALOG.

- **One-Stop Shopping.** More than 1000 microcomputer accessories and supplies - from diskettes and line printer paper to connectors and cables - for Apple, Atari, Northstar, TRS-80s and many others. Loaded with ideas for extra convenience and efficiency.
- **Easy Ordering.** By mail, phone, or TWX. Friendly, helpful, expert assistance.
- **Fast Delivery.** Your order shipped in 24 hours from the Inmac Center nearest you. Overnight emergency shipments also available.
- **Risk-Free Trial.** Try any product for 45 days. If not satisfied, return for full refund.
- **Guaranteed Quality.** Field-tested for precision performance and compatibility. Backed by warranties ranging up to 10 years - and some with Lifetime Guarantees.

Please RUSH my copy of the Microcomputer Idea Book & Catalog.

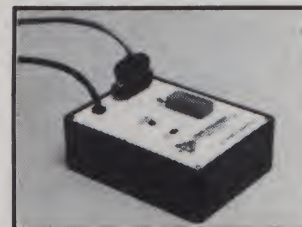
Name _____ Title _____
 Company _____ Phone _____
 Address _____
 City _____ State _____ Zip _____

**SEND TODAY FOR YOUR
 FREE MICROCOMPUTER
 IDEA BOOK &
 CATALOG OR
 PHONE (408)
 727-1970.**



inmac
 Catalog Dept.,
 2465 Augustine Dr.,
 Santa Clara,
 CA 95051.

Model 953A EPROM PROGRAMMER



- Programs 2508, 2758, 2516, 2716, 2532 and 2732 five volt EPROMs.
- Complete - no personality modules to buy.
- Intelligent - microprocessor based, programs and verifies any or all bytes.
- RS-232 serial interface - use with computer or terminal.
- Verify erasure command - verifies that EPROM is erased.
- Extended diagnostics - error output distinguishes between a bad EPROM and one which needs erasing.
- May be used for extremely reliable data or program storage.
- All power on programming socket under processor control. LED warning light indicates when power is applied.
- Complete with Textool zero insertion force socket.
- High performance/cost ratio.
- Standard DB-25 I/O connector.

PRICE \$289



BAY TECHNICAL ASSOCIATES, inc.

HWY. 603, P.O. BOX 387
 BAY ST. LOUIS, MISSISSIPPI 39520
 (601) 467-8231

feel the need to communicate through computers. Even accounting for the tariffs, more limited phone services and other technical factors, the number and activity of European systems is surprisingly low.

The Future?

A little over a year ago I predicted that the number of electronic message systems would decline as the information utilities (The Source and CompuServe) expanded their services and added special-interest message systems of their own. It appears that instead things stayed pretty level. The CP/M program exchange systems grew like a weed, others died off and the information utilities didn't gain as much ground as most of us thought they would.

I will be conservative and predict more of the same for the next 12 months. New systems supporting the IBM PC will flourish, the information utilities will make some inroads into specialized markets, but the total number of electronic message systems will stay about the same.

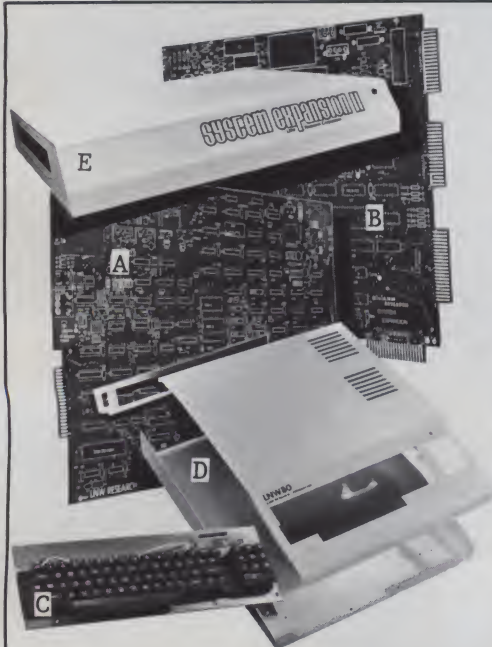
Electronic message systems represent a very creative and innovative way to become more involved in the two rapidly expanding technologies of computers and communications. If you haven't checked into one, you might be missing some good information or fun. Beg, borrow or buy a modem, pick a couple of systems from this list, and check in. □

Table continued.

Omega, Tampa, FL.....	(813)	257	2705*24
ONLINE Houston, TX.....	(713)	528	7025*24
ONLINE Santee, CA.... ID#=GUEST, pswd=PASS ...	(714)	561	7271*24
ONLINE Dickinsons Movie Guide, Mission, KS....	(913)	432	5544
ORACLE Classified System, Austin, TX.....	(512)	346	4495
Orange County Data Exchange, Garden Grove, CA.	(714)	537	7913
Orange County Technical Exchange.....	(714)	990	0608
PASBBS Santa Maria, GA.....	(805)	928	1507*24
PASBBS Torrance, CA.....	(213)	516	7089*24
PBBS Co-operative Comp Svc, Palatine, IL.....	(312)	359	9450*24
Pet BBS, Milwaukee, WI.....	(414)	282	8118
PHOTO-80, Haledon, NJ.....	(201)	790	6795
PMS - **IF**, Anaheim, CA.....	(714)	772	8868*24
PMS - Anchorage, AK.....	(907)	344	8558
PMS - Apple Bits, Kansas City, MO.....	(913)	341	3502*24
PMS - Apple Guild, Weymouth, MA.....	(617)	767	1303*24
PMS - Campbell, CA.....	(408)	370	0874*24
PMS - Chicago, IL.....	(312)	373	8057*24
PMS - Cincinnati, OH.....	(513)	671	2753
PMS - Computer City, Danvers, MA.....	(soon)		
PMS - Ellicott City, MD.....	(301)	465	3176
PMS - Escondido, CA.....	(714)	746	0667
PMS - Gulfcoast, Freeport, TX.....	(713)	233	7943*24
PMS - Indianapolis, IN.....	(317)	787	5486*24
PMS - Los Angeles, CA.....	(213)	334	7614*24
PMS - Massillon, OH.....	(soon)		

More →

COMPUTER KITS – FROM \$69.95



LNW SEMI-KITS can save you hundreds of dollars. By obtaining your own parts at the lowest possible cost and assembling the **LNW SEMI-KITS**, you can have the most highly acclaimed microcomputer in the industry – the **LNW80**. The **LNW SEMI-KITS** are affordable modules. You can start with a modest cassette system and expand to a full 4Mhz TRS-80 compatible system with 5 or 8 inch double density disks and color at any time.

A. LNW80 CPU – Made of high quality FR4 glass epoxy double sided circuit material, with plated-through holes and gold edge connector. It is fully solder-masked and silk screened. Here are just some of the outstanding features you will have when your **LNW80 CPU** board is fully assembled:
 • 16K RAM • Color and black and white video • 480 x 192 high resolution graphics • 64 and 80 column video • 4 Mhz Z80A CPU • Upper and lower case display • 500 and 1000 baud cassette I/O – **\$89.95**

B. SYSTEM EXPANSION – Expand the **LNW80** computer board, **TRS-80** and **PMC-80** computer with the following features: • 32K memory • Serial RS232C and 20Ma port • Real time clock • Parallel printer port • 5 inch single density disk controller • Expansion bus (screen printer port) • Onboard power supply • Solder-masked and silk screened legend – **\$69.95** (tin plated contacts) – **\$84.95** (gold plated contacts)

C. KEYBOARD – 74 key expanded professional keyboard – includes 12 key numeric keypad. Fully assembled and tested. – **\$99.95**

D. COMPUTER CASE – This stylish instrument-quality solid steel case and hardware kit gives your **LNW80** that professional factory-built appearance. – **\$84.95** Add \$12.00 for shipping.

E. SYSTEM EXPANSION CASE – This stylish instrument-quality solid steel case and hardware kit gives your **SYSTEM EXPANSION** interface that professional factory-built appearance. – **\$59.95** Add \$10.00 for shipping.

F. LNW80 CPU – HARD TO FIND PARTS KIT – \$82.00

G. LNW80 VIDEO – HARD TO FIND PARTS KIT – \$31.00

H. SYSTEM EXPANSION – HARD TO FIND PARTS KIT – \$27.50

I. LEVEL II ROM set. (6 chip set) – \$120.00

VISA and MasterCard accepted. Add \$3.00 for shipping plus \$1.00 for each additional item. All shipments via UPS surface. Add \$2.00 for U.S. Mail. Shipments outside continental U.S.: funds must be U.S. dollars. Sufficient shipping costs must be included with payment.

ORDERS & INFORMATION – (714) 544-5744
SERVICE – (714) 641-8850

LNW Research Corp.

2620 WALNUT Tustin, CA. 92680

• Circle 198 on Reader Service card.

CHIPS & DALE

Specializing in memory chips

THE INFLATION FIGHTERS!

Please note: software now available for CPM® and other select computers such as Apple® and Pet®.

Z80A CPU \$5.50
8251A \$4.75
1791 Controller \$21.00

—RAM—

4116 300ns 8/ \$11.00
4116 250ns 8/ \$12.00
4116 200ns 8/ \$13.00
4116 150ns 8/ \$16.00
2114L 300ns 8/ \$15.00
2114L 200ns 8/ \$16.50
4164 200ns \$7.90
6116 2K-8 BIT 150ns \$8.00

—EPROM—

2716 (5v) 450ns 8/ \$3.75 ea. \$4.15 ea.
2716-1 (5v) 350ns 8/ \$6.50 \$7.50 ea.
2732 (5v) 450ns 8/ \$7.25 ea. \$9.00
2532 (5v) 450ns 8/ \$8.00 ea. \$9.25

NEW Products Coming

*** Very Low Prices ***

Printers—Epson, Okidata, Paper Tiger & others

Terminals—Televideo's, Z-19's, Z-89's & others

Please call or write for other computer peripherals

Call for quantity pricing

Call or write for Catalog

Please allow up to 3 wks. for

Personal checks to clear

Master charge

VISA accepted.

Add \$3.50 Shipping & Handling

Wash. residents add 6.6% Sales Tax

Prices subject to change without notice

CHIPS & DALE
10665 N.E. 4th St.
Suite 400
Bellevue, WA 98004
1-206-451-9770

CHIPS & DALE
Specializing in memory chips
Circle 170 on Reader Service card.

Table continued.

PMS - McGraw-Hill Books, New York, NY.....	(212)	997 2488
PMS - Minneapolis, MN.....	(612)	929 6699*24
PMS - NIAUG, Lake Forest, IL.....	(312)	295 6926*24
PMS - O.A.C., Woodland Hills, CA.....	(213)	346 1849*24
PMS - P.A.M., New York, NY.....	(soon)	(soon)
PMS - Palo Alto, CA.....	(415)	493 7691*24
PMS - Pikesville, MD.....	!(301)	653 3413
PMS - Pleasanton, CA.....	(soon)	(soon)
PMS - Portola Valley, CA.....	(415)	851 3453*24
PMS - RAUG, Akron, OH.....	(216)	867 7463*24
PMS - Richland, WA.....	(509)	943 6502*24
PMS - Rutgers University, Piscataway, NJ.....	(soon)	(soon)
PMS - San Diego, CA.....	(714)	582 9557*24
PMS - San Jose, CA.....	(soon)	(soon)
PMS - Santa Clara, CA.....	(408)	554 9036
PMS - Santee, CA.....	#1 (714)	561 7277*24
PMS - Shrewsbury, NJ.....	(201)	747 6768
PMS - Software Unltd, Bellevue, WA.....	(206)	641 7340
PMS - Tampa, FL.....	(down temp)	(down temp)
PSBBS Baltimore, MD.....	(301)	994 0399*24
PSBBS Washington, DC.....	(202)	337 4694*24
Personal Message System-80, Deerfield Bch, FL.....	(305)	427 6300*24
Pet Bulletin Board, Ypsilanti, MI.....	(313)	484 0732*24
Potomac Micro Magic Inc., Falls Church, VA....	(703)	379 0303*24
Powercom 2.2, Largo, FL.....	(813)	577 3095*24
RCP/M AABBS New York, NY.....	(212)	787 5520
RCP/M CBBS CCCC Lake Forest, IL.....	(312)	234 9257
RCP/M CBBS CP/M Net Simi Valley, CA.....	(805)	527 9321
RCP/M CBBS Columbus, OH.....	(614)	272 2227*24
RCP/M CBBS HUG, Chicago, IL.....	(312)	671 4992*24
RCP/M CBBS Pasadena, CA.....	(213)	799 1632*24
RCP/M CBBS Vancouver, BC, Canada.....	(604)	687 2640*24
RCP/M Detroit, MI.....	(313)	584 1044-rb
RCP/M Logan Square, Chicago, IL.....	(312)	252 2136
RCP/M MAUDE Milwaukee, WI.....	(414)	241 8364*24
RCP/M MCBBS Detroit, MI.....	pass=	Sorcerer (313) 535 9186-rb
RCP/M MCBBS Keith Petersen, Royal Oak, MI.....	(313)	759 6569-rb
RCP/M MCBBS Superbrain, Lexington, MA.....	\$(617)	862 0781
RCP/M MCBBS TCBBS Dearborn, MI.....	(313)	846 6127*24
RCP/M Mississauga, Ontario, Canada.....	(416)	826 5394*24
RCP/M Palatine, IL.....	\$(312)	359 2553-rb
RCP/M RBBS Allentown, PA.....	(215)	398 3937*24
RCP/M RBBS Arvada Elect., Colorado Springs, CO.....	(303)	634 1158*24
RCP/M RBBS Brewster, NY.....	(914)	279 5693
RCP/M RBBS Cranford, NJ.....	(201)	272 1874
RCP/M RBBS Datanet, San Carlos, CA.....	(415)	595 0541
RCP/M RBBS GFRN Dta Exch., Garden Grove, CA.....	\$(714)	534 1547*24
RCP/M RBBS GFRN Dta Exch., Palos Verdes, CA.....	\$(213)	541 2503*24
RCP/M RBBS Huntsville, AL.....	(205)	895 6749-rb
RCP/M RBBS Hyde Park, IL.....	(312)	955 4493
RCP/M RBBS Larkspur, CA.....	(415)	461 7726*24
RCP/M RBBS Long Island, NY.....	(516)	698 8619-rb
RCP/M RBBS MUG, Mission, KS.....	\$(913)	362 9583*24
RCP/M RBBS New York, NY.....	(516)	791 1767
RCP/M RBBS Ocean, NJ.....	\$(201)	775 8705
RCP/M RBBS Rochester, NY.....	(716)	223 1100*24
RCP/M RBBS San Diego, CA.....	\$(714)	271 5615
RCP/M RBBS South Florida.....	(305)	255 6027
RCP/M RBBS Springfield, MI.....	(313)	559 5326*24
RCP/M RBBS Spring Valley, CA.....	!(714)	267 7331
RCP/M RBBS Westland, MI.....	(313)	729 1905-rb
RCP/M RBBS Yelm, WA.....	(206)	458 3086-rb
RCP/M Rick Martinek, Milwaukee, WI.....	(414)	774 2683-rb
RCP/M SJBBS Bearsrville, NY.....	(914)	679 6559-rb
RCP/M SJBBS Johnson City, NY.....	(607)	797 6416
RCP/M TRS-80 Chicago, IL.....	(312)	949 6189
RCP/M Terry O'Brien, Vancouver, BC, Canada....	(604)	584 2543
Remote Northstar Atlanta, GA.....	#1 (404)	926 4318*24
Remote Northstar Largo, FL.....	(813)	535 9341*24
Remote Northstar NASA, Greenbelt, MD.....	(301)	344 9156
Remote Northstar Santa Barbara, CA.....	(805)	682 7876
Remote Northstar Santa Barbara, CA.....	(805)	964 4115
Remote Northstar Virginia Beach, VA.....	(804)	340 5246

More



THE NEW

WEATHER SATELLITE HANDBOOK

BY DR. RALPH E. TAGGART

Here is the completely updated and revised edition of the best-selling **Weather Satellite Handbook**—containing all the information on the most sophisticated and effective spacecraft now in orbit. Dr. Taggart has written this book to serve both the experienced amateur satellite enthusiast and the newcomer. The book is an introduction to satellite watching, providing all the information required to construct a complete and highly effective ground station. Not just ideas, but solid hardware designs and all the instructions necessary to operate the equipment are included. For the thousands of experimenters who are operating stations, the book details all procedures necessary to modify their equipment for the new series of spacecraft. Amateur weather satellite activity represents a unique blend of interests encompassing electronics, meteorology and astronautics. Join the privileged few in watching the spectacle of earth as seen from space on your own monitoring equipment. Order **BK7383 \$8.95**

SAVE \$2.95

WEATHER SATELLITE HANDBOOK (first edition)

By Dr. Ralph E. Taggart WB8DQT. Valuable information in this first edition is *not included* in Dr. Taggart's just published book, **The New Weather Satellite Handbook** (see above). Chapters such as "How to Build an Electric Timer for Satellite Tracking" and "Building an Automatic Control for the Satellite Receiving Station" will no longer be available when this edition is out of print. This is a good entry level text for those discovering the exciting new use of weather satellites. Regular price: \$4.95. **SPECIAL PACKAGE PRICE—BOTH BOOKS FOR ONLY \$10.95, SAVE \$2.95!** (This offer available only while supplies last.) Order WS7300 and receive both editions of the Weather Satellite Handbook for only \$10.95 (plus \$1.00 shipping and handling charge).

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to: Microcomputing Book Nook • Peterborough NH 03458. Be sure to include check or detailed credit card information. Add \$1.50 first book, \$1.00 each additional book, \$10.00 per book foreign airmail. Questions regarding your order? Please write to Customer Service at the above address. Please allow 4-6 weeks for delivery. No C.O.D. orders accepted. For Toll Free ordering call 1-800-258-5473.

Circle 25 on Reader Service card.

ELECTRONICS CENTER..... SUMMER SPECIALS

Special Stuf at Special Prices...

PRINTER STUF:

Centronics 737-3.....\$ 550
NEC PC-8023(A).....\$ 519
Centronics 730-1.....\$ 349
QUME Sprint 5/45.....\$1999
Centronics 779.....\$ 888
9-1/2x11 — 20# white (2650s).....\$ 28

MONITOR STUF:

Zenith ZVM-121 12" b/g.....\$ 119
NEC JC-1202DH 12" RGB.....\$ 779
Amdek Video 100 12" b/w.....\$ 139
Amdek Video 300 12" b/g.....\$ 179
M&R Sup'R Term.....\$ 269
Videx VideoTerm.....\$ 279
NEC FVM-125 12" b/w.....\$ 159

MODEM STUF:

Hayes Micromodem II.....\$ 289
Hayes Smartmodem.....\$ 219
Biz-Comp (Apple) w/conn.....\$ 149

Novation Apple-Cat.....\$ 209
Novation D-Cat.....\$ 160
Novation Cat.....\$ 149
VisiCorp VisiTerm.....\$ 85
MicroCom MicroCourier.....\$ 199
MicroCom MicroTelegram.....\$ 199
Computer Station Flexitem.....\$ 59
Mountain CPS Multifunction.....\$ 179

OTHER STUF:

Scotch 744-0 SSD Diskettes (10)
with reinforcing rings.....\$ 28
Kensington System Saver
Apple pwr sw, fan & outlets.....\$ 75
Innovative Concepts Flip'N'File
up to 50 diskette storage.....\$ 24
Dos 3.2 3.3 Boot Switch
throw away that Basics disk.....\$ 20
Sirius Joypoint
hook up more joysticks.....\$ 55

CALL FOR LOW PRICES

on all our other computer gear

YOUR ELECTRONICS PLAYGROUND

CALL TODAY 1-800-228-4097

In Nebraska 402-476-7331

Or mail order to 1840 "O" St. Lincoln, NE 68508

Circle 146 on Reader Service card.

POCKET COMPUTER NEWSLETTER

A NEWSLETTER FOR POCKET COMPUTER USERS

This timely, compact publication provides up to the minute information on pocket computers, including models such as the Radio Shack TRS-80 PC-1 and PC-2, Sharp Electronic's PC-1500 and PC-1211, Casio, Panasonic/Quasar HHCs, and others as they are announced. We only cover PCs capable of executing a high level language such as BASIC.

☐ Up to the Minute News ☐ Product & Equipment Reviews
☐ Important Operating Tips ☐ Practical Programs ☐ More
By Subscription Only: for a calendar year period (January — December). You get all issues published to date for the calendar year in which you subscribe, at the time you subscribe.

MC/VISA Phone Subscriptions: (203) 888-1946

- ☐ 1981/82 Charter Subscriber (Issues 1 — 20). \$40.00 in U.S. (U.S. \$48.00 to Canada. U.S. \$60.00 elsewhere.)
- ☐ 1982 Regular Subscriber (Issues 11 — 20). \$30.00 in U.S. (U.S. \$36.00 to Canada. U.S. \$45.00 elsewhere.)
- ☐ Sample issue. \$3.00 in U.S. (U.S. \$4.00 elsewhere.) *Due to credit card minimum, this item cannot be charged.

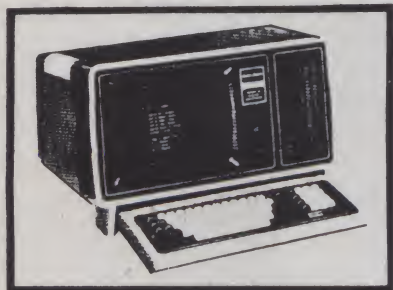
Orders must be accompanied by payment in full. We do not issue invoices for the POCKET COMPUTER NEWSLETTER.

Thank you for your remittance.

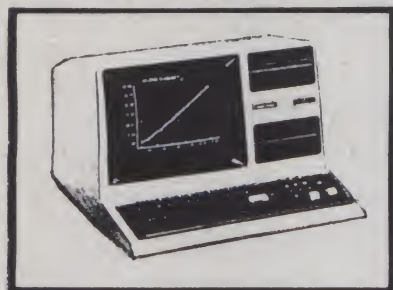
Name: _____
Addr: _____
City: _____ State: _____ Zip: _____
MC/VISA #: _____ Expires: _____
Signature: _____

POCKET COMPUTER NEWSLETTER
35 Old State Road, Oxford, CT 06483

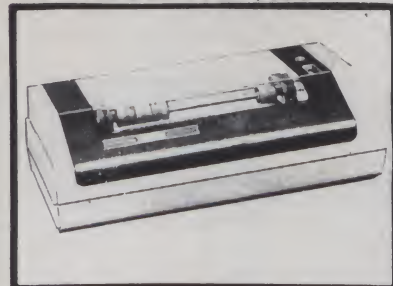
**We have THE
LOWEST PRICES
ON TRS-80™**



Model II 64K \$3249.



Model III 16K \$839



Line Printer VII \$309.

OKIDATA	Microline 80	\$394
	Microline 82	\$499
EPSON MX-70		\$389
EPSON MX-80		\$479

\$ SAVE

**\$ MOST ORDERS
SHIPPED WITHIN
ONE BUSINESS DAY**

VERBATIM DATALIFE™ DISKETTES	
5 1/4-inch (box of 10)	\$25.95
8-inch Double-Density.	\$43.95

* Payment: Money Order, Cashiers
Check, Certified Check, Personal
Checks require 3 weeks to clear VISA.
MASTERCARD — Add 3%.

WRITE OR CALL FOR OUR COMPLETE PRICE LIST.

CALL (602) 458-2477

— All prices are mail order only —

RAND'S

2185 E. FRY BLVD.

SIERRA VISTA, AZ 85635

TRS-80 is a trademark of Tandy Corporation.

Table continued.

SCANBOARD-80, Atlanta, GA.....	(404)	457	8384
SEACOMM-80 Seattle, WA.....	(206)	763	8879*24
SIGNON Reno, NV.....	pswd=FREE ...	(702)	826 7234
		\$(702)	826 7277
SISTER Staten Island, NY.....	(212)	442	3874*24
SLAMS St. Louis, MO.....	(314)	839	4307
SNAC Bill-Baud.....	(603)	880	8746*24
ST80-CC EAPBB & General Store, Tampa, FL.....	(813)	986	3128
ST80-CC Lance Micklus, Inc., Burlington, VT.#1	(802)	862	7023*24
ST80-CC Buddy's Super BB, Tampa, FL.....	(813)	885	6187
ST80-PBB Monroe Camera Shop, Monroe, NY.....	(914)	782	7605
TCBBS W.E.B.B. New York, NY.....	#1(212)	799	4649
TCBBS B.A.M.S. New York, NY.....	(212)	362	1040*24
TCUG BBS, Washington, DC.....	(703)	960	2056*24
	(202)	960	2056*24
TFC New York, NY.....	(212)	799	9177*24
TELEMESSAGE-80, Atlanta, GA.....	(404)	962	0616
Triple Cities Bulletin Board, Endicott, NY....	(607)	754	5571*24
Westside Download, Detroit, MI.....	(313)	533	0254
XBBS Hamilton, OH.....	(513)	863	7681*24
ZBBS Minneapolis, MN.....	(612)	426	9028

Circle 308 on Reader Service card.

Circle 222 on Reader Service card.

**COMPUTER CASSETTES
100% ERROR-FREE**



	12	24
LENGTH	PACK	PACK
C-05.....	69¢	59¢
C-10.....	79¢	69¢
C-20.....	99¢	89¢

- Fully Guaranteed!
- World's Finest Media
- Custom Storage Case, Add 20¢ Each
- UPS Shipping Add \$3.00 Per Pack



FOR ORDERS ONLY

1-800-426-4747

Extension 480



MICRO-80™ INC.

K-2665 NO. BUSBY ROAD
OAK HARBOR, WA 98277

**SPIKE-SPIKERS™
Protect-Control-Organize**

Computers & sensitive electronic equipment.
Helps prevent software "glitches", unexplained
memory loss, and equipment damage



**Deluxe Power Console
\$79.95**

PROTECTS with transient
absorber & dual five-stage
filter. Absorbs power line
transients & filters out RFI
"hash."

CONTROLS with 8 individ-
ually switched 120 vac
grounded outlets. Main on-
off switch, fuse & indicator
light.

ORGANIZE your computer
& other equip. power cords.
No more overloaded octopus
cube taps.

2-Socket Plug-In Models

MINI-I

Transient absorber only

\$34.95

MINI-II

Transient absorber plus
3-stage RFI "Hash" filter

\$44.95

4-Socket Plug-In Model with Light

QUAD-I

Transient absorber only

\$49.95

QUAD-II

Transient absorber plus
dual 3-stage RFI "Hash" filter

\$59.95

Order Factory Direct

215-865-0006

Out of State Order Toll Free

800-523-9685



Electronics Co. Inc.
Colony Drive Ind. Park
6584 Ruch Rd., Dept. MC
Bethlehem, PA 18017



PA Res. add 6%

COD Add 3.00 + Shipping
Dealers Invited



NOVEMBER 1982

MICROCOMPUTING

People Blasts Off
Little Microcomputing launched

☐ **Bill me**☐ MC☐ VISA☐ AMEX

Canada \$27.97/one yr. only, US Funds

Foreign \$44.97/one yr. only, US Funds drawn on US Bank

Card# _____ Exp. Date _____

Signature _____ Interbank # _____

Name _____

Address _____

City _____ State _____ Zip _____

please allow 4-6 weeks delivery

Box 997 Farmingdale, NY 11737

327B7

BOOKS

Please send me the following Microcomputing products:

[illegible]

Shipping and handling charges:
\$1.50 1st book, \$1.00 each additional book
(UPS, use street address)
\$10.00 each book overseas airmail

Shipping/Handling -

Total_

Please allow 4–6 weeks for delivery. No C.O.D.s accepted.

Enclosed \$ _

Enclosed \$ _____ ☐ Check

☐ M.O.

— □ — ch

1

Enclosed \$ _____

Card # _____ Exp. date _____

Card #

Signature _____

Interbank # _____

Signatur

Name _____

Name _____

Address_____

Address

City _____

City —

State_____

State _____

Microcomputing • Mail Order Dept. • Peterborough NH 03458



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

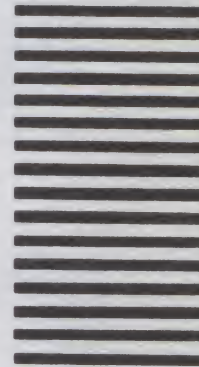
BUSINESS REPLY CARD

FIRST CLASS PERMIT NO 1024 PETERBOROUGH NH 03458

POSTAGE WILL BE PAID BY ADDRESSEE

MICROCOMPUTING®

Subscription Dept.
POB 997
Farmingdale NY 11737



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO 1024 PETERBOROUGH NH 03458

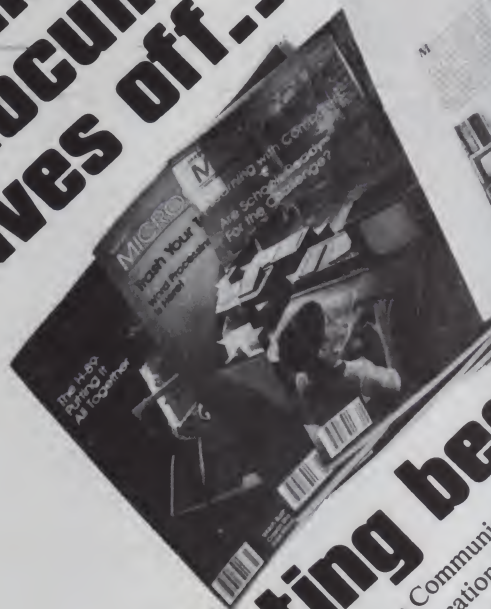
POSTAGE WILL BE PAID BY ADDRESSEE

MICROCOMPUTING®

Att. Mail Order
Peterborough NH 03458



Where the manufacturer's documentation leaves off....



Videographic

Microcomputing begins!

Subscribe to *Microcomputing* and go that extra step beyond the directions that came with your computer. Find out what's changing in microcomputing and how it affects you. Get more articles, information and usable programs than any other comparable magazine (we feature better quality articles on a wider range of topics more valuable with *Microcomputing*—the journal designed especially to expand and explore the limits of this new and incredible field. *Microcomputing*'s articles are written by experts to teach the newcomer the basics and expand the skills of the experienced. You, your family, friends and associates will all benefit from the comprehensive information that *Microcomputing* features on the following subjects: Business, Data Communications, Education, Science, Games, Hardware Modifications, Music, Reviews, Tutorials, Personal Applications, Programs and MORE.

A full year (twelve issues) subscription to *Microcomputing* is available to you for only \$24.97. If you aren't completely satisfied with the first issue you receive write "CANCEL" across the invoice and send it back. The issue is yours to keep, no obligation. Go beyond your limits to the top of the microcomputing field today! Return the coupon below (a photocopy is acceptable) or use the business reply card in this issue. For extra fast service call toll free 1-800-258-5473.

MICROCOMPUTING
A Wayne Green Publication
Subscription Dept., P.O. Box 997, Farmingdale, NY 11737

YES! Take me beyond the limits of my system.

☐ 1 yr., \$24.97 ☐ Bill me ☐ MC ☐ VISA ☐ AE ☐ Check/Money Order

Mail this coupon to: MICROCOMPUTING, Subscription Department, P.O. Box 997, Farmingdale, NY 11737

Name _____ Address _____ City _____ State _____ Zip _____

Card # _____ Interbank # _____ Signature _____

Exp. Date _____

Please allow 4-6 weeks for delivery.
MICROCOMPUTING
A Wayne Green Publication
Subscription Department
P.O. Box 997
Farmingdale, NY 11737

327B7

CALC-PLUS®

ACCOUNTING SYSTEM OVERLAYS

Expand your BUSINESS application of Calcstar,™ Supercalc,™ Visicalc™

Calc-Plus™ has been designed to complement your electronic spread-sheet programs, CALCSTAR,™ SUPER-CALC™ or VISICALC.™ These accessory programs are ideal for business use where the user either lacks the technical training to develop such an application or simply does not have the time to do so. This series of accounting programs increase the usefulness of Calcstar, Supercalc and Visicalc.

Small office users will find they can quickly apply these programs for entry of checking account data and easily handle bank reconciliation and account distribution. The Accounts Receivable application permits the addition of Cash Receipts, tied to individual customer accounts.

Payroll is formatted for hourly workers and salaried employees and permits the entry of only one daily time entry to update the individual payroll liability, computes FICA, permits entry of FIT and computes the net check. A payroll statement form permits the printing of period and year to date information from the payroll check. A depreciation scheduled for 4 categories of up to 200 assets speeds the computation of depreciation expense and, if required, a full Balance Sheet and Income Statement tie all these together! Comes with Audio Cassette Instructions...**NO MANUALS!** Mount on a second drive and load to Supercalc, Calcstar or Visicalc. Available in 5" and 8" formats for most popular computer systems.

Sold only through selected dealers

Priced at only \$169.95

Accounts Receivable	\$ 29.95	Cash Receipts Journal (with	\$ 39.95
Accounts Payable	\$ 29.95	accounts receivable ledger & pro-	
Cash Disbursements Journal	\$ 39.95	vision for customer invoicing—	
Payroll	\$ 29.95	can hold up to 162 line items)	
Depreciation	\$ 29.95	Full System (contains each	\$169.95
		of above)	

These CALC-PLUS™ programs will be released during 1982:

Cash Flow Analysis Cash Flow Forecasting • Rate of Return on Investment Cost-Volume-Profit Analysis

The Contribution Margin Overhead Analysis • Fixed and Variable Overhead Analysis • Book Value For Decision Making • Fixed and Variable Budgeting • Capital Budgeting

Discounted Cash Flow Analysis on an Investment • Constant Order Quantity/Safety Stock Inventory • Direct Costing • Evaluating Your Marketing Organization • Inventory Valuation

© Copyright 1982 MICRO Instructional Inc. Trademarks of MicroPro International Corp. Sorcim Corp. Visicorp.

Calc-Plus® a registered trademark
of Micro Instructional Investment Corp.

INSTRUCTIONAL INC

6299 W. SUNRISE, FT. LAUDERDALE, FL 33313, (305) 584-3133

LETTERS TO THE EDITOR

Unscrambling Puzzles Defense Against Program Theft Quick Fix for Apple Owners

Rewiring Help

I need help rewiring a standard six-button telephone keyset so that it may be used with a Western Electric (Ma Bell) 212A modem. I will pay reasonable copying costs and postage.

Doug Ranz
PO Box 1425
Warren, MI 48090

Unscrambled Words

Mr. Kenneth Wasserman's article "Popping and Pushing Permutations in Basic" in the December 1981 issue of *Microcomputing* (p. 50) finally provides a short and sure program for solving scrambled word puzzles.

As I read further in the December *Microcomputing*, I also came upon the article "Recursion: Solving Age-Old Mysteries" by Mr. Doug MacDonald (p. 104). It occurred to me that it would be informative to add the factorial (N!) calculation from that article to Mr. Wasserman's program.

Listing 1 is the result. It contains Mr. Wasserman's original program with original line numbers plus the factorial calculation as a subroutine in lines 4990-5510. There are also some additional embellishments to round out the program and to adapt it to the TRS-80 Model I with its 64 character screen line length.

These additions by line number are:
5-7 A title.

100 Clear to zero variables when program is asked to return to unscramble a word after a previous one is finished. This results from an affirmative answer to the new lines 150 and 152. Also, added a question statement to go with Input so that user knows what to do.

112 To call in the factorial subroutine.

115 Variable LL is introduced to set spacing of word listing so words will appear in uniform columns when printed by lines 2031-2041.

140 Prints added for spacing.

150-152 Choice of another word to be unscrambled or to exit program.

2031-2041 Column spacing for words that are 4, 5, 6 or 8 letters long. All others fall through to line 2041 which arbitrarily puts two spaces after each word. This

```
5 CLS:PRINT@398,"W O R D   U N S C R A M B L E R"
6 FOR X=1 TO 1700:NEXT
7 CLS
10 ' Permutations by K. Wasserman, MICROCOMPUTING, Dec. '81
20 :
30 ' This program will list all possible permutations of the
35 ' word given as input. A recursive subroutine in lines
40 ' 1000-1060 produces the next word to be output. The sub-
45 ' routine in lines 2000-2050 can be used to simply print
50 ' the rearranged word or it can be extended to request
55 ' further analysis on the word presented to it.
80 :
90 CLEAR 1000
100 CLEAR:INPUT "WHAT ARE THE LETTERS TO BE UNSCRAMBLD";W$
110 L=LEN(W$)
112 GOTO 5000
115 LL=L
120 DIM W$(L),I(L)
130 W$(L)=W$
140 GOSUB 1000:PRINT:PRINT
150 INPUT"WANT TO UNSCRAMBLE ANOTHER ONE (Y/N)";A$
152 IF A$="Y" OR A$="y" THEN CLS:GOTO 100 ELSE PRINT:PRINT
"THANK YOU, GOODBYE":PRINT:PRINT:END
999 :
1000 IF L=0 THEN GOSUB 2000:RETURN
1010 I(L)=L
1020 W$=MID$(W$,1,L-1)+MID$(W$(L),I(L),1)+MID$(W$,L+1)
1030 W$(L-1)=MID$(W$(L),1,I(L)-1)+MID$(W$(L),I(L)+1)
1040 L=L-1:GOSUB 1000: L=L+1
1050 I(L)=I(L)-1: IF I(L)=0 THEN RETURN
1060 GOTO 1020
1999 :
2000 ' This subroutine is passed a word in the variable W$.
2010 ' Note that W$ is a permutation of the original word input
2020 ' to this program. Its value should not be changed by
2025 ' this subroutine.
2030 :
2031 IF LL=4 THEN PRINTW$;" ";:RETURN
2032 IF LL=5 THEN PRINT W$;" ";:RETURN
2033 IF LL=7 THEN PRINT W$;" ";:RETURN
2034 IF LL=8 THEN PRINT W$;" ";:RETURN
2041 PRINTW$;" ";
2050 RETURN
4990 ' Subroutine for finding factorial of a number (N!).
4991 ' BASED ON ARTICLE IN MICROCOMPUTING, DEC. 1981 PAGE 108.
4995 ' From info in article by D. MacDonald,
4998 ' MICROCOMPUTING, Dec. '81, pg. 104.
5000 Q=1:N=L
5010 IF N<2 THEN GOTO 5500
5020 Q=Q*N*(N-1)
5030 N=N-2
5040 GOSUB 5010
5500 PRINT:PRINT"THERE WILL BE "Q" COMBINATIONS FOR THOSE LETTER
S."
5510 PRINT:PRINT"PRESS ENTER TO CONTINUE.";:INPUT;Z$:CLS:GOTO 11
5
```

Listing 1. Word Unscrambler program.

gives correct spacing for six letter words, but may split longer words in the last column. Most scramble puzzles have no more than seven letter words. Seven letters result in 5040 permutations which may require more patience to examine on the computer screen than most per-

sons have available.

4990-5510 Informs user of the number of permutations that will be required for the word he has entered if all possibilities are examined.

Charles B. Steele
La Jolla, CA

	DOS 3.2	DOS 3.3
From Basic	POKE 4815, 172 :	POKE 4789, 172 :
	POKE 4816, 171	POKE 4790, 171
or		
From monitor	*12CF: AC AB	*12B5: AC AB

Table 1. Fixes for the Apple DOS 3.2 and 3.3 Renumber utility program.

A Spock Special?

Wayne Green suggests (Publisher's Remarks, May 1982, p. 8) that software protection might be afforded by having attempts to illegally copy it result in the destruction of the computer. Aw, c'mon! Star Trek and Mission Impossible notwithstanding, it is a rare computer indeed (and I would say a poorly engineered one) that will permit any software operations to permanently damage the hardware.

There are stories, of course. Like the CDC engineer who had learned how to program a 6600 to access memory at just the right frequency to get the individual cores in memory to spin, cutting their way through the wires. But micros don't have core. Or do you think that repeatedly slamming the disk head into the stops will destroy it? Perhaps someone has come up with a Spock Special: a program is instructed to compute the Halting Test on itself, and in "frustration" it slowly overheats and catches fire. It makes spectacular screen play but lousy science.

I should think that any self-respecting engineer or computer manufacturer would rather go to the bother of including machine-readable serial numbers than to allow a clever program (which is indistinguishable from an ordinary program with a bug) to destroy it. The best defense against program theft is for the software suppliers (I am one, so I know) to provide a valuable program at a reasonable price.

Tom Pittman
Itty Bitty Computers
San Jose, CA 95153

D to A Converters

Thanks for "A 'Pennypinching' Video Display" in the April issue (Richard McLaurin, p. 64). I haven't tried it yet, but I plan to soon. Fig. 1 contains an obvious error: MC-1408L8s are D to A converters, not A to D converters.

Garth Fisher
College Place, WA

Reply:

Mr. Fisher is correct. I appreciate his interest and hope he enjoys the display.

Richard McLaurin
Odessa, FL

Computers in Psychology

The Association of Eastern North Carolina Psychologists is planning a wide-ranging conference with the tentative title, The Use of Computers in Psychology. We anticipate that the focus will be on microcomputers. Possible topics for workshop and/or panel discussions include: The Use and Misuse of Computers in Psychological Assessment, The Computer as a Therapy Aid, Computer Models of Mental Health Programs, Artificial Intelligence, Statistical Analysis, The Use of Computers in Experimental Psychology, Computer Games as Therapy Tools, Private Practice Business Applications, Computer Models of Human Behavior and Computers as Aids in Training Psychologists.

I would appreciate hearing from readers regarding suggestions, speakers, etc.

Steven R. Edelman
Conference Chairperson
105 Lou Drive
Goldsboro, NC 27530

Apple CP/M

I recently acquired CP/M with Microsoft's Basic 80 for my Apple II+ computer. Additionally, I also run CBasic2. My problem lies in trying to find a user group that deals with CP/M for the Apple. I recently wrote to CPMUG and I received a very polite reply that they don't handle the Apple format. Unfortunately for CPMUG, they are passing up a rather large percentage of the market by ignoring the Apple CP/M user.

The question now remains—are there any Apple CP/M user groups? Are there any CP/M user groups that even recognize the Apple CP/M user?

Dana B. Farnsworth
2137 Oak St., #3
Jacksonville, FL 32204

Polybytes Update

Many thanks to D.C. Shoemaker for his fine review of the Lucidata Pascal programming system from Polybytes (*Microcomputing*, April 1982, p. 203). Although Mr. Shoemaker has for the most part accurately summarized the features of Version 2.8 of this system, he incor-

rectly stated that the REAL and RECORD data types have been omitted from this implementation. On the contrary, both variant and invariant RECORD types are supported, as is support for type REAL with 9 decimal digits of precision. In addition to the software floating point routines found in the standard system, the graphics support system can be configured to fully utilize the hardware math circuitry on the HA-8-3 graphics board.

Supplementing the Pascal system reviewed by Mr. Shoemaker, Polybytes has recently released Version 3.8 of the Lucidata Pascal system. This more sophisticated version of the popular system is available for both HDOS and CP/M, and, at \$145, is one of the better values available in the software marketplace. Contact Polybytes for details on these powerful Pascal programming systems.

Larry C. Reeve
Polybytes
325 19th St. S.E.
Cedar Rapids, IA 52403

See the review of Polybytes' Lucidata Pascal Version 3.8 in our Software Review section, page 159.—Eds.

That's Some Daughter!

In the April 1982 issue of *Microcomputing* (Software Reviews, p. 207), a review on a program that allows you to key Hebrew text into an Apple II computer has an amusing typographical error.

The illustration which shows the Hebrew equivalent of "the house is 20.5 meters long," in truth said "the daughter is 20.5 meters long"!

Gary Mokotoff
Teaneck, NJ

אָרְךְ הַבֵּית 20.5 אֲמָה

Fig. 1.

Reply:

You are, of course, right. What I meant to be house came out daughter. I left out a jod in the word (see Fig. 1). I stand corrected.

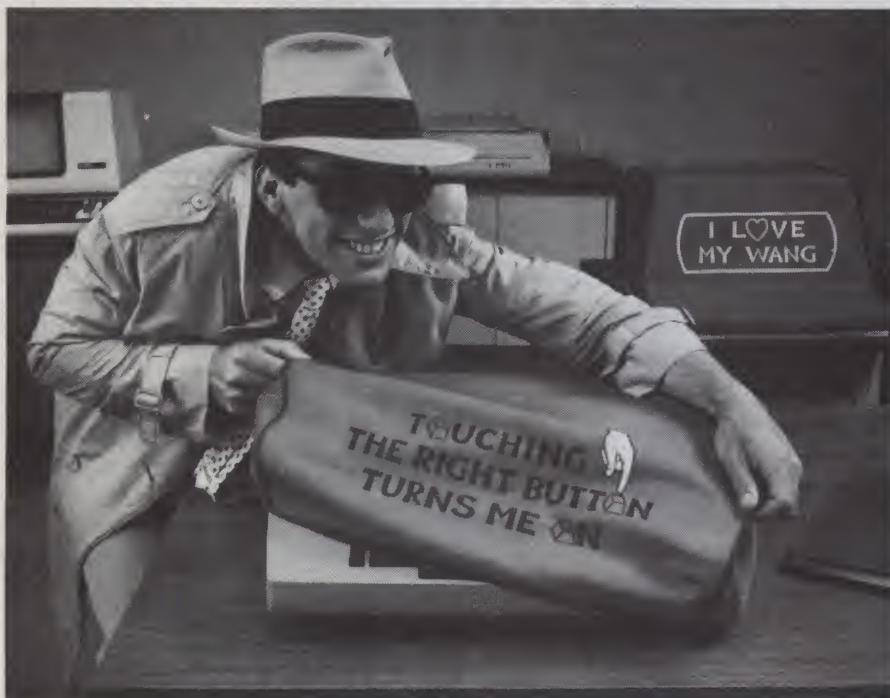
The beauty of a word processor, English or Hebrew, is that it is so easy to correct.

G.R. Brieger
Redmond, WA

Project SERAPHIM

Project SERAPHIM (Systems Engineering Respecting Acquisition and Propagation of Heuristic Instructional Materials) is aimed at setting up a model system for dissemination of instructional materials in chemistry. Many of the in-

THE GREAT COMPUTER COVER-UP HAS BEGUN.



Have fun with your computer terminal. Make a statement with your personal computer, word processor, even your electric typewriter.

Because now you can cover them all up with Toppers, the hottest fad in dust covers since the color gray.

Toppers come with a choice of expressions—just like T-shirts—so you can tell the world how you feel about yourself and your job. Any of the expressions in the coupon below are available on any of the covers, with all lettering applied by a high-quality silk-screening process.

And you can choose from three beautiful colors: Whole Wheat Natural, Better Dead than Red, and Out-of-the Blue. So you not only express yourself and make people laugh, you also make your working environment a more attractive place. **Someone you know deserves one.**

Toppers make a perfect gift. If you think hard, you'll think of someone who deserves one. We have nasty ones for your boss. Sweet ones for your secretary. Slightly wild ones for your friends. Check the list.

Tell your boss it's a business expense. If you need an excuse for filling out a petty cash slip, we'll give you several.

Toppers are made of deluxe, 100% natural cotton sailcloth, carefully sewn to

custom-fit most terminals and electric typewriters. They're also color-fast, completely washable, and they even keep the dust off to protect your valuable equipment.

Best of all, they cost only \$13.95, which is about what you'd pay for an ordinary, boring, plastic dust cover.

Join our cover-up operation and win \$25! Do you have a special expression you'd like to see offered? Then send it to us on a postcard or piece of paper. If we use it, and you're the first to send it in, we'll pay you \$25. (No purchase necessary. One winner per expression, or variation, only. Our judgement, exclusively. Payment to anybody constitutes full discharge of obligation. Void where prohibited by law.) Send in as many as you like but one per postcard or piece of paper, please.

Order now and start a new fad in your office. If you order now, you can be the first person in your place of work to own a Topper. For only \$13.95, how can you go wrong? We'll even refund your money if you're not completely satisfied.

Just call our toll-free number and use your MasterCard or VISA. Or fill in the coupon, indicating your choice of expression and color, and your terminal or typewriter model. To order more than one, fill out the same information on a separate sheet of paper. Please allow three weeks for delivery.

To order call toll free:

800-543-3000

In Ohio: 1-800-582-1364 Operator #244

Yes! Send me a Topper. I have checked the appropriate boxes for expression, color, and equipment.
☐ I have enclosed a check or money order for \$14.95 (\$13.95 plus \$1.00 shipping/handling. Massachusetts orders add 5% sales tax.)
☐ I have indicated my credit card account number

Expressions

- | | |
|---|---|
| <p>A. <input type="checkbox"/> Mafia Machine Hands Off</p> <p>B. <input type="checkbox"/> This machine EXPLODES on Contact</p> <p>C. <input type="checkbox"/> I Love My Wang</p> <p>D. <input type="checkbox"/> Touching the Right Button Turns Me On</p> <p>E. <input type="checkbox"/> An Apple, Run by a Peach</p> <p>F. <input type="checkbox"/> I Break for Animals</p> <p>G. <input type="checkbox"/> Only Angels Have Wings</p> <p>H. <input type="checkbox"/> I Love My IBM</p> <p>I. <input type="checkbox"/> Programmers Do It Byte by Byte</p> <p>J. <input type="checkbox"/> I'm Trying Hard, I Wish You'd Notice</p> | <p>K. <input type="checkbox"/> Women Without Men are like Fish Without Bicycles</p> <p>L. <input type="checkbox"/> Doing it the Old Fashioned Way—by the Numbers</p> <p>M. <input type="checkbox"/> No Nukes</p> <p>N. <input type="checkbox"/> The User of This Machine is INDISPENSABLE</p> <p>O. <input type="checkbox"/> GIGO Processor Garbage in—Garbage out</p> <p>P. <input type="checkbox"/> Word Processors are for Lovers</p> <p>Q. <input type="checkbox"/> Some day, I May Be In Charge</p> <p>R. <input type="checkbox"/> Everybody Makes Mistakes</p> <p>S. <input type="checkbox"/> I'd Rather Be Sailing</p> <p>T. <input type="checkbox"/> Secretaries Have Feelings Just Like People</p> |
|---|---|

Colors

- ☐ Whole Wheat **NATURAL** ☐ Better Dead than **RED**
☐ Out-of-the **BLUE**

Equipment

- | | |
|---|--|
| <p>Computer Terminals</p> <p>1. <input type="checkbox"/> IBM 3276, 3277, 3278</p> <p>2. <input type="checkbox"/> IBM 3101</p> <p>3. <input type="checkbox"/> IBM 5251</p> <p>4. <input type="checkbox"/> DEC VT-100 Series</p> <p>5. <input type="checkbox"/> Lear Siegler ADM 3, 3A, 5, 21, 31</p> <p>6. <input type="checkbox"/> Lear Siegler ADM 32, 36</p> <p>7. <input type="checkbox"/> ADDS Regent 20, 25, 40, 60</p> <p>8. <input type="checkbox"/> ADDS Regent 100, 200, 300</p> <p>9. <input type="checkbox"/> Televideo 910, 912, 920</p> <p>10. <input type="checkbox"/> Televideo 925, 950</p> <p>11. <input type="checkbox"/> Wang 2200, VS Series</p> <p>Word Processors, Typewriters</p> <p>12. <input type="checkbox"/> IBM Selectric II (15" carriage)</p> <p>13. <input type="checkbox"/> IBM Selectric III (15" carriage)</p> | <p>14. <input type="checkbox"/> IBM Electronic Typewriters Mod 50, 60, 75 (specify 15" or 19" carriage)</p> <p>15. <input type="checkbox"/> IBM Display-writer</p> <p>16. <input type="checkbox"/> CPT 6000, 6100</p> <p>17. <input type="checkbox"/> CPT 8000, 8100</p> <p>18. <input type="checkbox"/> Lanier LTE-3 No Problem</p> <p>19. <input type="checkbox"/> NBI OASys 3000, 3000S, Docuwriter</p> <p>20. <input type="checkbox"/> WANG WPS/OIS Series</p> <p>21. <input type="checkbox"/> WANG Wangwriter</p> <p>Personal Computers</p> <p>22. <input type="checkbox"/> Apple II (no CRT)</p> <p>23. <input type="checkbox"/> Apple II Dual Disk (no CRT)</p> <p>24. <input type="checkbox"/> Apple III</p> <p>25. <input type="checkbox"/> IBM Personal Computer</p> <p>26. <input type="checkbox"/> Radio Shack TRS-80 Mod II</p> <p>27. <input type="checkbox"/> Radio Shack TRS-80 Mod III</p> <p>AD code: 07KM</p> |
|---|--|

Name _____

Address _____

City _____ State _____ Zip _____

☐ MasterCard ☐ VISA

Card Number _____ Expiration Date _____

Signature _____ Date _____

TOPPERS
 175 Bedford Street, Lexington, MA 02173

Memory Expansion for Apple®

The company that brought you the first 32K RAM board for Apple II® and Apple II+® now offers:

VC-EXPAND/80™

NEW!

**80 column
VisiCalc® display
on an Apple II !!**

Now in addition to greatly expanding your workspace you can add 80 column capability to Personal Software's 16 sector VisiCalc®. Works with Videx 80 column card. Previous owners of VC-EXPAND™ can upgrade to VC-EXPAND/80™ for \$25.

ONLY

\$125

VC-EXPAND™ MEMORY EXPANSION FOR VisiCalc®

Expand memory available to Personal Software's 16 sector VisiCalc®. Add 32K, 64K, or even 128K to your present workspace (even if you already have a 16K card in use!) with this program plus one or more Saturn boards. Simple operation.

ONLY

\$100

■ 128K RAM

ALL FOR ONLY

\$599

Our newest product. Fully compatible with Saturn's 32K RAM board, 16K RAM cards and language card.

Includes 5 comprehensive software packages:

1. MOVEDOS (relocates DOS)
2. RAMEXPAND (for Applesoft®, Integer®)
3. PSEUDO-DISK for DOS 3.3 or 3.2
4. PSEUDO-DISK for CP/M®
5. PSEUDO-DISK for PASCAL

■ 64K RAM

\$425

A medium range memory expansion board which can be upgraded to 128K at a later date. (Upgrade kit sold for \$175) Includes all 5 software packages offered with the 128K board.

■ 32K RAM

STILL ONLY

\$239

The old favorite for Apple users. Includes our first 3 software packages (above) with CP/M® and PASCAL pseudo-disks now offered as options (\$39 each).



**SATURN
SYSTEMS™**

(313) 973-8422

P.O. Box 8050, Ann Arbor, MI 48107

Circle 117 on Reader Service card.

structional modules handled by the project will be microcomputer-based. The project will set up procedures for soliciting, evaluating, use-testing, publicizing and disseminating instructional modules. SERAPHIM will also draw upon other National Science Foundation-sponsored projects in chemistry, chemical engineering, materials science, physics and mathematics for modules of interest to chemists. Modules will be reviewed and tested in classrooms and laboratories, and reviews by users will appear in the *Journal of Chemical Education*.

In addition to preparing and distributing modules, the project will attempt to improve the skills of authors of instructional computer programs through workshops for novice and advanced authors. Programming contests will also be held, with a cash prize for the best instructional program as judged by a group of chemical educators. The first workshop and programmer contest will take place at the Seventh Biennial Conference on Chemical Education, August 8-12.

Another major facet of Project SERAPHIM will be to explore the feasibility of using a nationwide timesharing service (such as The Source, Compuserve's MicroNet, Telenet, etc.) as a medium for exchange of ideas about instructional programming.

Project SERAPHIM has a special interest in producing materials that teach polymer chemistry, industrial chemistry, and environmental chemistry. We would like to hear from any industrial chemists or engineers who have personal microcomputers and are interested in writing programs that simulate on-the-job experiences.

Persons who want more information about the project, contact Dr. John W. Moore, Visiting Professor, Department of Chemistry, University of Wisconsin at Madison, Madison, WI 53706. 608-262-0215.

John W. Moore
Madison, WI

Help Out the Y

The Franklin YMCA is proposing to construct a cablecasting FM radio and television station for the purpose of training junior and senior high school students from our service area in broadcasting techniques. We will be using the local television cable system to carry our programming to the community.

Part of our plan of operation will depend on a computer to produce our program log. We plan to format our broadcast time on a weekly basis. By inventorying our records by title, year, type, artist, record length, ranking within the year and by inventory number, the deejay only needs to identify his program time and day and list the inventory numbers of the records chosen and the com-

puter will list the music and announcements in the proper order, logging them in accordance with the announcement and record lengths, minute by minute. This procedure will allow us to choose the type of music by rejecting music which does not meet the format for the particular time slot. (In other words—no hard rock during the dinner hour.)

We have contacted several computer companies with the hope of obtaining a computer which would meet our needs through donation without much luck. It occurred to us that perhaps one of you may be upgrading to a larger computer and might be interested enough in our activity to donate your old unit to us.

I can be contacted at either the YMCA, Otter and West Park St., Franklin, PA 16323, or at my office (814-437-5711).

James F. Pankratz, Jr.
Disc Jockey Club Adviser
Franklin, PA

Fixes for Apple DOS 3.2 and 3.3

The Renumber utility program supplied with Apple DOS 3.2 and 3.3 has an insidious bug—after you use Renumber, your program may still appear to run perfectly, so you may not even notice that your program's operations have been al-

tered! Renumber will correctly change all line number references to agree with the new line numbers. Unfortunately, Renumber may also alter any number in an arithmetic expression which (a) follows an asterisk (the multiply operator), and (b) has the same value as a pre- Renumber line number.

I obtained the corrections for the DOS 3.2 version from the Apple Hotline in May of 1980. I just discovered that the problem still exists in the DOS 3.3 version, and I am still seeing letters in various magazines from perplexed Apple users.

The fixes for the DOS 3.2 and DOS 3.3 versions of the program are similar—they involve swapping two data values in the program as shown in Table 1.

To permanently correct the Renumber program, you must

- load Renumber
- do the two pokes for your version of DOS
- save Renumber

All Apple owners should take note of these fixes. Even if you don't use Renumber, you'll be able to help out the next guy, who may not have read about this problem. For future reference, Apple dealers have a loose-leaf notebook which answers commonly-asked questions (including "What's wrong with Renumber?"); you just have to know to ask!

Robert C. Leedom
Glenwood, MD

Circle 335 on Reader Service card.

THE MULTI-USER FRIENDLY MEMORY BOARD WITH

NO COMPROMISE



- ☐ 256 kilobytes 150 NS dynamic ram
- ☐ Designed to operate in any S-100 System IEEE or Non-IEEE
- ☐ 16-bit addressing option: Powerful Macrotech Memory Mapping (M³) bank select architecture allows each 4K block of the 16 bit (64K) logical addresses to be dynamically translated to any 4K block of the 256K on board physical memory.
- ☐ 24-bit direct addressing option

- ☐ "Educated" cycle control module generates all timing on board *asynchronously* for maximum access speed and uniform operation
- ☐ Comprehensive technical manual with complete installation guide and source listings for MP/M II™* and "Virtual Disk" solid state disk applications.
- ☐ DMA operation fully supported in strict accordance with IEEE 696 standard.
- ☐ 8/16 data transfer protocol
- ☐ Parity error detection

- ☐ Multilayer board and bus signal filtering for noise-free operation.
- ☐ Full one year warranty

If you wish, send a check or money order for \$1,379 (in California add 6% sales tax where applicable). Manual available at \$25.00 each refundable with order.

*Registered Trademark of Digital Research Corp.
OEM & Dealer Inquiries Invited



MACROTECH International Corp.,
22133 Cohasset St., Canoga Park,
California 91303
(213) 887-5737

Osborne— Behind Guerrilla Lines

This free-lance journalist reported on the Afghan rebels' resistance to the Soviet-backed regime in their country and filed his stories back to the U.S. using an Osborne computer.

By David Kline

Kunar Province, Afghanistan— The incoming mortar round whistled dully through the night sky, slamming with a loud crack into the side of the hill. Desperately looking around for cover, a dozen Islamic guerrillas in turbans fired their rifles and machine guns ineffectively at the pro-Russian militia position on the ridgeline above. Then another mortar round crashed into the trees 50 yards away, temporarily drowning out the staccato sounds of automatic rifle fire all around us.

Me, I lay flat on my back, trying to calculate the odds of the mortar crew above us lobbing one directly into my lap. It occurred to me that I wasn't being paid nearly enough for this assignment.

Seeing as how I had no other option but to at least try to act like a reporter, I pulled out my notebook and started to record my observations of the battle. I also began making plans for how I was going to file the story. I faced a three day walk over the mountains before I could get back to civilization—the dusty little frontier town of Peshawar, Pakistan, just 20 miles from the legendary Khyber Pass on the Afghan-Pakistan border. But even once I arrived, I still didn't know if I'd be able to file. For I intended to employ equipment never

before used from this part of the world: a portable computer and telephone modem.

Oh well, first things first, I told myself. And the first thing I had to do that night was to find a rock to crawl under.

The experiment, for that's what it was, first took shape in late 1981. I had already decided to purchase a portable Osborne computer for word-processing, mail list and business applications in my free-lance writing agency. Then, when I was asked by CBS News, the *Chicago Sun-Times* and the *Los Angeles Times* to go back on assignment to Afghanistan (it would be my fourth trip in three years), an idea began bubbling in my head. Could I take the Osborne with me to the war zone, or at least close to it, and use the machine to both write and file my stories?

The advantages of using a computer as a reporter's tool in a situation like this would be significant. First and foremost, any articles I would write using a word-processing computer—with its quick and easy ability to edit and re-edit copy—would naturally be superior to what I could either write longhand or what I could hack out on a clackety manual typewriter. But also, if I could use a telephone modem or some other transmittal system to get my copy back to the newspapers, I could avoid the costly and often unreliable public telex offices in Pakistan.

Ordinarily, free-lance journalists like myself not based in a telex-

equipped overseas office must go to a public telex office and present handwritten or typewritten copy to an often-bored and always insufferable bureaucrat-of-an-operator. He may or may not send your message that day, may or may not send it as written, and may or may not send it at all if it happens to offend his government (most telephone and telex systems outside the United States are government-owned and operated).

The implications of the experi-



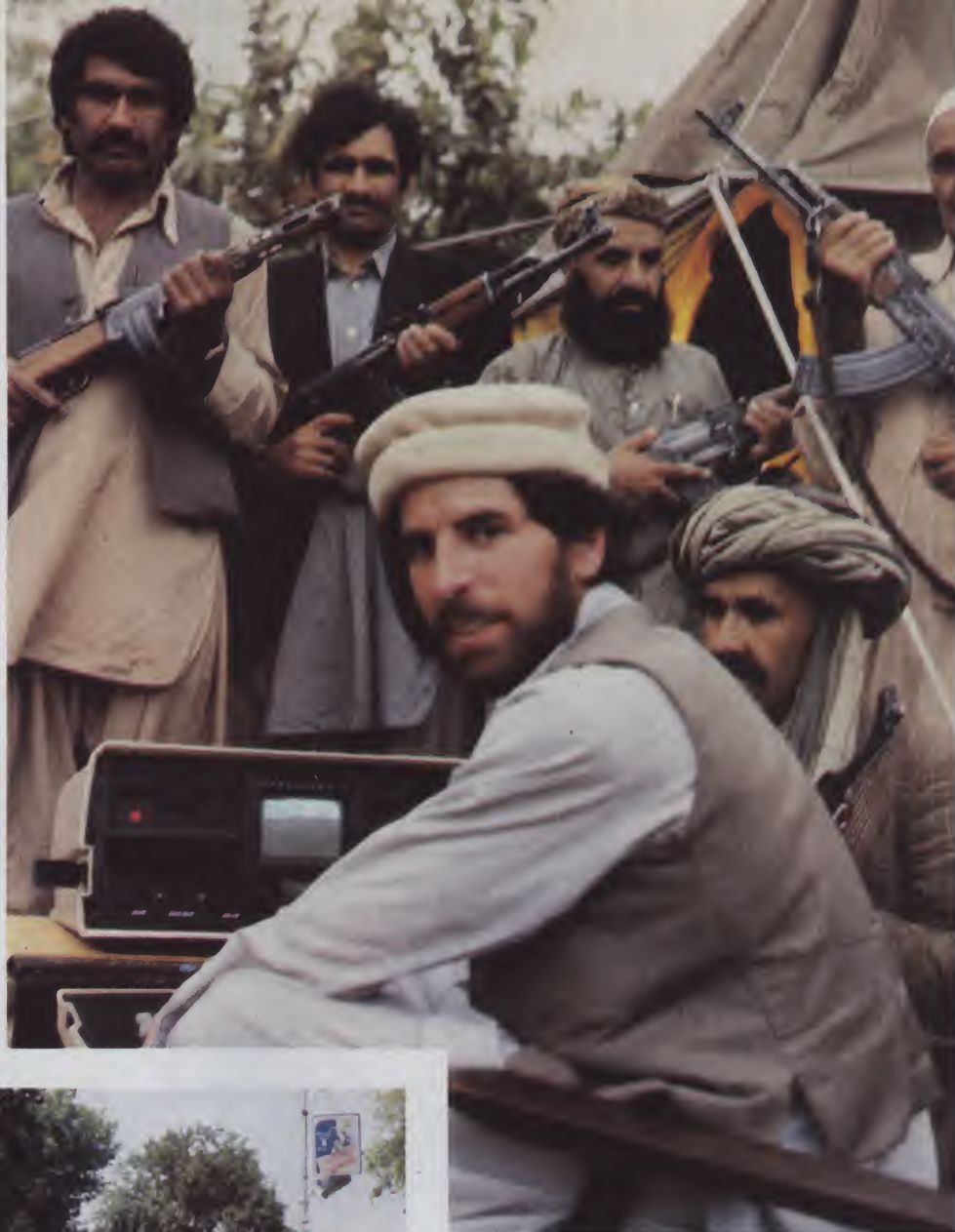
David Kline is director of Impact Features (2329 N. Sawyer Ave., Chicago, IL 60647), an agency for free-lance journalists. He reported from behind Afghanistan's rebel lines—his fourth trip in three years—on assignment for CBS-TV, the Los Angeles Times and the Chicago Sun-Times.

ment, however, went far beyond the immediate practical task of reporting on the Afghan war. There are currently more than 100,000 full-time professional journalists in the United States, with an additional 2 to 3 million people who consider themselves part-time writers. While staff journalists at many of the larger daily newspapers do use office-based CRTs to write their stories, the use of portable intelligent terminals or computers in on-location reporting is not at all common. And as for free-lance writers and journalists—that majority of our profession who don't have access to large office-based computer systems—the potential of computer technology as a professional writing tool is only now being examined with any seriousness.

The point, then, was simple: If I could successfully use a computer to write and file articles from the Afghan war zone—with all the inherent problems posed by using this technology in a third world country 12,000 miles from the nearest Computerland dealer—then presumably anyone could use the same technology from Podunk, Illinois, or anywhere else in the world.

From the start, the project faced a number of questions that needed answering:

- Was an Osborne durable enough to stand up to the punishments of a



On-location reporting from behind guerrilla lines is possible with the Osborne. David Kline (foreground) and Afghanistan independence fighters huddle around the Osborne at a guerrilla encampment near the Khyber Pass. (Photo by Impact Features)



David Kline and the Osborne computer survived a 12,000-plus-mile journey by plane, bus, car, horse, camel, foot and even by horse-drawn rickshaw to report on the Afghan rebels' resistance to the Soviet-backed regime in their country. The author is about to ride over to a friend's house in Peshawar to transmit an article back to the States. (Photo by Impact Features)

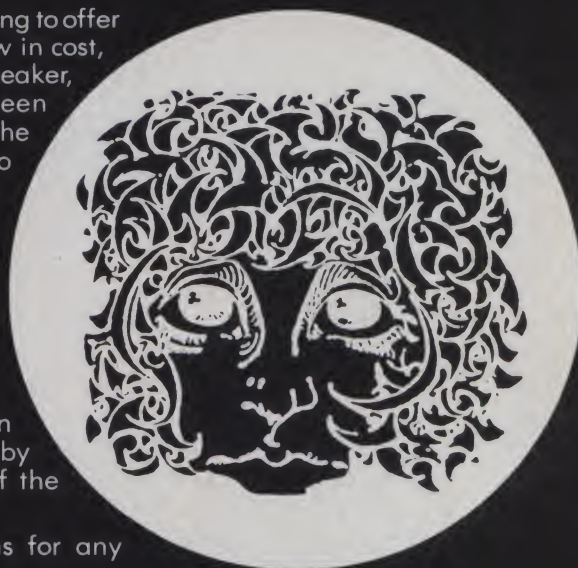
ATARI SAYS ITS FIRST WORD

WITH A VOICE BOX BY THE ALIEN GROUP!

THE ALIEN GROUP has emerged from the underground, daring to offer a full-featured speech synthesis system that is flexible, low in cost, and needs no accessory devices. No Interface, Cables, Speaker, Amp, or External Power Required! VOICE BOX has been designed and programmed by Atari users to become the integral voice of a 400 or 800 computer. Simply plugged into the serial port, VOICE BOX automatically routes all speech into the speaker of your television monitor. With the menu-driven operating system supplied, you'll be creating original, intelligible speech within moments after loading disk or cassette. No lengthy or obscure instructions to wade through.

The system includes a dictionary which translates typed text into VOICE BOX's phonetic language. The dictionary can be expanded to include as many as 5,000 words of your own custom vocabulary. Unlimited speech can be produced by straightforward phonetic definition at any time, even if the dictionary should be full.

The speech routines can be called from other programs for any purpose you can conceive. Here are a few suggested uses:



VOICE BOX
Speech Synthesizer

SOUND EFFECTS

- Access 64 phonemes at any of 4 pitch levels to add filtered, contoured sound to the Atari audio repertoire.

GAMES

- Program aliens to hiss threats, moan when destroyed.
- Devise weird, non-human tongues for dungeon dwellers.
- Insert cryptic spoken clues in maze games.

COMPUTER OPERATION

- Code verbal prompts and error messages that command attention and leave the current display intact.

EDUCATION

- Gain an introduction to the principles of phonetics.
- Learn touch typing through spoken feedback from the keyboard.

In addition, the *Random Sentence Generator* included in the operating system, which prints and speaks endlessly startling, amusing, even poetic combinations of words supplied by the user, helps teach school children to identify parts of speech and recognize a variety of sentence structures.

A minimum of 16K RAM is required by the operating system. Either disk or cassette includes both 16K and 32K versions. Try VOICE BOX for up to 10 days, and if it isn't the finest value you've ever seen in a computer peripheral, the most challenging and provocative addition you've ever made to your system, return it in its original condition for a full refund.

When ordering specify disk- or cassette-based operating system, and enclose check or money-order for \$169, or state your VISA or MASTERCARD number. Send mail orders to: **THE ALIEN GROUP**

27 West 23rd Street
Dept. MC-1
New York, New York 10010

or telephone orders from
10 AM to 6 PM New York time
(212) 924-5546

ALSO AVAILABLE AT LEADING COMPUTER STORES THROUGHOUT THE WORLD.

Atari is a registered trademark of Warner Communications.

Circle 249 on Reader Service card.

12,000-mile journey by plane, bus, car, horse, camel and foot? Would it operate in the hot, dusty and dirty Asian environment?

- How does one get the Osborne to operate on Asian electrical currents, and what other power modifications would be needed for the modem and any other peripherals?

- Will a modem work from halfway around the world, and if so, what type of modem and baud rate should be used? What communications software should be used?

These were merely the main hurdles that needed to be crossed, of course. There were literally dozens of other questions that needed answers before I could leave for Afghanistan. These ran the gamut from finding out whether I needed a U.S. Commerce Department export license to take a microprocessor out of the country (no); to whether Pakistan's military martial-law government allowed the transmission of data over phone lines (yes or no, depending upon who you talked to); to how I was going to explain the concept of a personal business computer to a Pakistani airport security officer whose natural inclination after examining the Osborne would be to associate me with the CIA.

Luckily, this last question never came up—my description of the machine as a "Hollywood typewriter" was usually glumly accepted. But since I had no desire to spend a few weeks in a Pakistani jail, I brought along a lot of magazine advertisements to demonstrate the wide use of computers among everyday consumers.

I won't go into all the details of how each problem was solved, each question answered, but suffice to say that I called literally hundreds of experts in the computer and communications field. I even placed questions on computer bulletin-boards, and in at least one instance, solved one problem that way.

Among those who helped the most, Mr. Stan Sharman and the entire staff of the Computerland store in Niles, Illinois, were instrumental in determining the various modifications I would need to make in order to use the Osborne and modem in Pakistan. Actually, it was rather simple in the end, and I learned to switch the Osborne internally from 115 to 200 V ac myself. But in the beginning, we didn't know what would be required.

Next, Mr. Wayne Holder of Oasis Systems in San Diego generously put

There were literally dozens
of other questions
that needed answers
before I could leave
for Afghanistan.

together a pre-release copy of his superb spelling-checker software program, The Word, especially condensed and modified for the Osborne's mini-floppy drives. The Word, incidentally, is superior to any other spelling software I have seen, and for only \$75 is only one-half to one-third the price of its competition. As a journalist, I valued its word-count capability far more than its spelling correction programs, because when an editor says he wants 900 words, he really doesn't want 905.

In addition, the folks at Electronic Specialists, Inc., in Natick, MA, were

extremely helpful in rush-modifying one of their excellent Kleen Line power filters and spike suppressors. Without this device, Central Asia's erratic currents would have reduced my Osborne to just one more charred and smoking casualty of war.

But most important of all to the project was Mr. Marty Cawthorn, of the Cawthorn Scientific Group in Dearborn, MI. The firm specializes in computers and computer-communications, as well as custom software development. Marty put in literally dozens of hours trying to answer questions and solve problems as they came up, even when I was in Asia. He also acted as my relay to the various newspapers I was working for. Since these did not have error-checking ability in their computer communications programs, the plan was that Marty would first receive my articles via the Modem 7 error-checking communications program, then retransmit them the short distances to the newspapers involved.

On the Road

By March 21, I was ready to leave. Armed with my Osborne 1, a U.S.

Communications?

Improve your business operations with improved communications. We can help you to lead your firm towards the use of better, more reliable, and more effective communications technology.

★ Computer: Telex Interface Package.

Want to use the power and versatility of your computer on the Telex II (TWX) network? We have the connecting link: **TXL: Telex Link.**

★ Special Communications: Consulting and Special Software.

Applications of our services have spanned the globe - from Ann Arbor to Afghanistan. To see how we can help you with your special requirements, give us a call. Want a good, interesting reference? Read this month's cover story by David Kline.

Communications !

Consultants ★ Problem Solvers.

Communications ★ Computer Applications.

**Cawthon
Scientific
Group**

24224 Michigan Avenue
Dearborn, Michigan 48124
Phone: 313-565-4000
Telex: 810-221-1265 Cawthon Drbn.

500 K Great Reasons to Buy Your Diskettes from Snappware!

Byte for byte, performance counts. Every byte of data you record is important. That's why Snappware offers Scotch diskettes, the highest quality diskette on the market at very competitive prices. Scotch diskettes are tested and guaranteed error-free. And the low abrasivity saves your read/write heads.

Scotch Brand 744-0

5¼ inch single sided, single density, soft sectored with hub rings.

One box	\$23.00/box
Five boxes	\$22.50/box
Ten boxes	\$22.00/box
Twenty boxes	\$21.50/box

Scotch Brand 744D-0

The premium grade mini-floppy. Double density certified, with hub rings. The very finest available for your Model III.

One box	\$27.00/box
Five boxes	\$26.50/box
Ten boxes	\$26.00/box
Twenty boxes	\$25.50/box

Scotch Brand 741-0

Eight inch single sided, double density soft sectored. The very finest available for your Model II.

One box	\$33.00/box
Five boxes	\$32.00/box
Ten boxes	\$31.00/box
Twenty boxes	\$30.00/box

When it comes to diskettes, we have the best price per byte.



Authorized
Distributor
Information
Processing
Products



SNAPPWARE
SNAPPWARE

Time saving power at your
fingertips.



CALL TOLL FREE:

1-800-543-4628

OHIO RESIDENTS
CALL COLLECT: (513) 891-4496
3719 Mantell
Cinti., Ohio 45236

Robotics Phone Link acoustic modem capable of transmitting at 300 baud, a powerline filter and spike suppressor, various adaptor plugs and a Radio Shack converter to power the modem, the necessary software, two disk drive cleaners, my manuals and a couple of screwdrivers, I set off for Asia and the Khyber Pass.

The first stop on my journey was Paris, where I had an assignment to interview exiled Iranian president Abolhassan Bani-Sadr. The interview would provide me with my first chance to use the computer in a foreign environment, operating at 220 V ac, as well as the first test of the modem in transmitting clearly an article over phone lines at great distances.

On the morning of March 23, I arrived for the interview at Bani-Sadr's heavily-guarded apartment in the Parisian suburb of Cachan, and by 2:00 PM I was back at my hotel near the Place D'Opera in the center of the city. For the next five hours, I wrote and rewrote my article, enjoying the ease of editing which WordStar's editing functions allow. By 7:00 PM, I was ready to call Marty and transmit the piece to him for relay to several newspapers.

I hesitated. Indeed, I was so nervous I had to go out for a walk. What if the modem didn't work? The French phones are shaped slightly different than ours—square handsets rather than round—so what if the skewed fit doesn't generate a strong enough signal through the modem? Or what if the computer and modem do work, but the French telephone operator calls the Duexieme Bureau to arrest me for being a spy? As you can see, I was somewhat paranoid about what lay ahead, but I went back to my room, braced myself, and placed the call.

As soon as Marty answered, I set my modem to originate; he set his to answer. When I heard his carrier tone, I slammed my receiver down into the modem and punched out the command for sending a file: S B: Banisadr.Int.

Then I hit the return key and watched the machine go to work:

"File Open, size 78 Sectors," declared my computer screen. Nonchalantly, it added that it was "Awaiting Initial NAK."

No response from Marty's computer. After a second, still no response, and I was sweating. Meanwhile, the



I had what I came for...
now it was time
to start filing my reports....

We didn't know for sure
that the military authorities
wouldn't have people
listening in
on all overseas calls.



screen kept blandly repeating that it was "Awaiting Initial NAK," as if I didn't know.

Finally, I heard those lovely grating sounds of the Osborne disk drives in action—something like a flatulent woodpecker, actually—and I knew the acknowledgement was received. The damn thing was working! First it sent Sector #1, then Sector #2 and on and on it kept on going!

Then I noticed something amiss at Sector #48:

"H RCD," smirked my Osborne.
"Not ACK."

"Not ACK?!" I shouted back. Before I could really work myself into a frenzy, however, the problem resolved itself, whatever it was. Probably just a spike of noise in the overseas phone call.

"Send Sector #49," the Osborne began again, this time (or so it seemed to me) in a tone of disapproval over my obvious emotional instability. And so it went, all the way up to "Send Sector #78." Then came, finally, "All Transfers Completed!"

OK, so I successfully computed from Paris, a city, after all, that is very much at the center of our modern technological world. The real challenge lay ahead. It still remained to be seen whether I'd be able to use a computer as a reporter's tool from the legendary Land of the Khyber, where life has hardly changed at all in the 25 centuries since Alexander the Great's conquering spearmen first met and fought the fierce Afghan tribes in battle.

Afghan Trek

After two weeks behind guerrilla lines, I was ready to return to base. It wasn't just the physical stresses of the journey, nor was it the debilitat-

ing effects of the various creatures who had decided to make my stomach their home. Simply put, I had what I came for—a detailed analysis of the state of the Afghan war after three full winters of Russian occupation, as well as interviews and photos of all surviving Soviet prisoners held by the rebels—and now it was time to start filing my reports.

By April 15, I was back in Peshawar, typing away at my Osborne in Dean's Hotel, the favorite haunt of Western journalists. First, I decided, I'd type up a detailed outline of my observations, suggest a breakdown and order to my articles, and file that with my editor at the *Chicago Sun-Times*. After looking at my material, he'd tell me which piece to file first, what length in words, etc.

Of course, everything depended on whether I could even use the modem successfully from Peshawar. No one had ever tried it before, and there were some significant hurdles to be overcome.

The telephone call itself, for example, would have to travel 1000 miles by microwave from Peshawar to Karachi, then 6000 miles by satellite from Karachi to London, and finally another 5000 miles via undersea cable to New York and then Dearborn, MI. There, Marty Cawthorn would try to catch my scattered signals out of the ether and make some sense out of them. But at that distance, with at least a 500 millisecond delay in transmission, the chance that the distortion would be strong enough to prevent reliable transmission was great. Indeed, it was very hard to hear someone on the other end of the phone at that distance.

Then there was the possibility—nay, the likelihood—that a Pakistani telephone operator listening in on the call would cut us off at the first hint of beeping rather than talking. We could reduce that risk by having Marty call me and thus go through an American operator rather than the other way around, but still we didn't know for sure that the military authorities wouldn't have people listening in on all overseas calls.

And finally, there was the possibility of the power going out in my hotel room, what with my Osborne and modem running off one outlet. The watt usage was certainly not great, but who knew the limits of a hotel electrical system in a city that only recently was electrified?

Win \$500!

The First National Computer Owner Survey 50 Second Prizes of \$10 each!

In order to keep developing and bringing you very special hardware, software, and publications, we've been commissioned to find out what you, the customer, wants and needs.

In addition to contributing to the computer owners' data base, you have a chance to win \$500... just for filling out this survey.

JUST TAKE A FEW MINUTES, ANSWER EVERY APPLICABLE QUESTION - YOU MUST TO BE ELIGIBLE - AND MAIL TO US NO LATER THAN OCTOBER 31, 1982. FOR 20¢ YOU COULD WIN HUNDREDS.

NAME _____										ADDRESS _____														
CITY/STATE/ZIP _____										AGE _____ SEX _____														
Circle: SINGLE MARRIED # CHILDREN _____										COMPUTER OWNED HOW LONG _____														
COMPUTERS(¢) YOU OWN OR USE (Circle) APPLE ATARI TRS-80 IBM PC																								
HEWLETT-PACKARD HEATH ZENITH OSBORNE XEROX DEC TEXAS INST.																								
NORTH STAR COMMODORE VECTOR CROMEMCO OTHER _____																								
# DISK DRIVES _____										OWN HARD DISK? _____ OWN MODEM? _____														
PRINTER BRAND _____										MONITOR BRAND _____ OPERATING SYSTEM(S) _____														
APPROX. # DISKETTES OWNED _____										BRAND PREFERENCE _____														
AMOUNT OF MEMORY (Circle) 8K 16K 24K 32K 48K 64K 128K																								
# DISKETTES PURCHASED/YEAR _____										LANGUAGES YOU PROGRAM WITH OR USE (Circle) _____														
BASIC FORTRAN COBOL MACHINE ASSEMBLER MONITORS FORTH																								
ALGOL PASCAL C ADA APL LISP CAI																								
DO YOU WRITE YOUR OWN SOFTWARE (Circle) YES NO																								
APPROXIMATE NUMBER OF SOFTWARE PROGRAMS YOU OWN PER CATEGORY:																								
EDUCATION _____					BUSINESS _____					GAMES _____					SCIENTIFIC _____									
HOBBY _____					HOME USE _____					OTHER _____														
YOUR PROFESSION _____										PRIMARY USE FOR COMPUTER _____														
APPROX ANNUAL INCOME (Optional) _____										MOST RECENT EDUCATION LEVEL _____														
WHICH PUBLICATIONS DO YOU SUBSCRIBE TO OR READ REGULARLY (Circle all that apply)																								
APPLE ORCHARD					BYTE					CALL-APPLE					COMPUTE					COMPUTERWORLD				
CREATIVE COMPUTING					DESKTOP COMPUTING					INTERFACE AGE					INFOWORLD									
MICROCOMPUTING					MICRO					MICROSYSTEMS					NIBBLE					PEELINGS II				
POPULAR COMPUTING					PERSONAL COMPUTING					SOFTSIDE					OTHERS									
APPROX # COMPUTER BOOKS OWNED _____																								
WHAT NEW PRODUCTS, AND PUBLICATIONS DO YOU WISH TO SEE COME ABOUT? Please be specific and staple answer to survey when completed.																								
Mail all completed surveys by Oct. 31, 1982 to:																								
NATIONAL COMPUTER OWNERS' SURVEY - BOX 264WOB - WEST ORANGE, N.J. 07052																								
Entrants must be computer owners or users and answer every applicable question. A random drawing, eligibility approval and list of winners will be verified by a Notary Public. Winners will be notified by Dec. 31, 1982. Grand Prize winner gives IRV Brechner Enterprises the right to use name and photo in future surveys and advertising. No purchase necessary. Limit one entry per person. Entries must be postmarked no later than Oct. 31, 1982 and reach us by Nov. 15, 1982. Prizes include one cash award of \$500, and 50 cash prizes of \$10 each. All survey entries become property of IRV Brechner Enterprises; none will be returned. All prizes will be awarded by Nov. 31, 1982. All Federal, State and Local taxes are responsibility of the winner. This contest void where prohibited by law. For a prize winner list, send a self-addressed stamped envelope to IRV Brechner Enterprises, Box 264WOB, West Orange, N.J. 07052.																								

On April 16, at 6:00 PM, I placed a call to Marty, asking him to call me back for transmission. While waiting for the return call, I set up my modem and got a shock: the phone simply wouldn't fit in the modem's handset because it was a good inch longer than the standard size. I could have kicked myself for assuming anything in this part of the world, and for not checking to make sure that the hotel room phone would work.

So when Marty called, I gave him another number to call in an hour, the number of a friend with a phone that would work. Then, folding up my Osborne and throwing the modem, power filter and attachments into a camera bag, I grabbed a horse-drawn rickshaw and raced over to my friend's house to wait for Marty's return call.

At 8:00 PM sharp, Marty called again. I set the modem on originate, and when I heard his answer carrier tone, I placed the phone in the handset and punched out the code for sending a file.

"File Open, Size 68 Sectors," flashed the screen, followed by, "Awaiting Initial NAK."

One second, two seconds, three...nothing was happening! I picked up the phone, as did Marty, and asked what the problem was. He didn't know. Try again, he suggested.

Once again: "Awaiting Initial NAK." And once again, no acknowledgement from Marty's computer! Over the next ten minutes, we tried just about everything we could think of, variously setting my modem on originate, answer, half-duplex or punching out alternate codes for sending a file on Modem 7. Nothing worked.

Then Marty had an idea: "Start counting backwards from 10," he urged. "I want to try something." As I began counting, he started talking at the same time, but I couldn't hear what he was saying.

"Just as I thought," Marty announced. "Somehow, I think we've got a one-way circuit here. The signals can only go in one direction at a time."

The significance of this fact escaped my technically unsophisticated mind, until Marty clued me in. It seems that our modem handshaking program required simultaneous two-way sound transmission. Thus the one-way circuit was preventing file transfer.



As it turned out,
I had an unfair advantage:
the Osborne 1 computer
and the modem....

The era of the portable computer
as a reporter's tool
is upon us.



"Okay, just send your file using your Microlink program, without error-checking," Marty advised. But I was so flustered by the failure, I forgot the code for loading a file into the system and then transmitting it. I told Marty to call me the next day.

When he did call the next morning I was prepared for the Microlink file transfer, though I was also concerned about the text being garbled since we weren't going to use the Modem 7's error-checking functions. Marty, too, was prepared: he had decided to tape-record my signal, then amplify it for clarity before feeding it into his computer for deciphering.

"Okay, Marty," I asked, "ready to go?"

"Give me a second," he replied, "while I make sure the recorder's set up properly."

While waiting, I gazed out the window at the fresh, crisp morning sky over Peshawar. It's going to be a beautiful day, I thought; not a cloud in the sky.

That's it! Not a cloud in the sky!

"Marty, wait a minute!" I shouted into the phone. "Let's try it once more using Modem 7. We had a big thunderstorm last night. Maybe the atmospheric disturbance blocked our transmission."

Indeed, it turned out that it had. With a circuit that morning that allowed simultaneous two-way sound transmission, our two computers were soon talking and humming contentedly to each other across 12,000 miles of mountain, desert, ocean and outer space. With only a half-dozen or so sectors needing retransmission due to garbling, my 68 sector file was successfully transferred and relayed to the *Chicago Sun-Times*. Later that day, I received a telex from the editor that since no one else could beat me

on these stories, I should wait until my return to Chicago to actually file the finished articles, which would then be run in a four-part series. That way, we'd also be able to develop my film and use photos with the series.

So, I thought proudly, the whole crazy experiment worked. Still, the victory was a somewhat hollow one. Though I knew a computer-plus-modem combination would work, I hadn't had the opportunity to actually test the whole system out in competition with the typewriter-plus-telex system more commonly used by reporters. As they say in war, my Osborne had not yet been tested in the heat of the battle.

Three days later, my computer received its baptism of fire. While routinely visiting my contacts in the Afghan rebel leadership, I had stumbled across an amazing piece of news. The Afghan rebels' most important Soviet prisoner, a civilian specialist by the name of Mikhail Evgeny Okrimyuk, had apparently been executed by his guerrilla captors.

Why the rebels shot this man I didn't know. What I did know was that this was a major piece of news and that I was the only one that had it. But in order to get confirmation, I needed help. I called my friend Alain Faudeaux, the permanent correspondent in Pakistan for the prestigious Agence France Presse (AFP), who was based 100 miles south of Peshawar in the city of Islamabad. In exchange for giving him the story and an equal chance to beat me in filing it, Alain would come up to Peshawar and give me those contacts of his that I needed to confirm the execution of Okrimyuk.

By 2:30 in the afternoon of April 19, Alain and I had all we needed to run with the story. Taking the room next to mine at Dean's Hotel, he began furiously hacking out his story on an ancient manual. After completing the piece, he planned to take it to the public telex office for transmission to AFP's main office in Paris. Had Alain been working from his home base in Islamabad, of course, he would have had access to his own telex machine. But for all intents and purposes, we were both away from our home base, both in possession of a great story, and both working like mad to beat the other to print.

As it turned out, I had an unfair advantage: the Osborne 1 computer and the modem. With glitteringly beauti-

ful copy stored on floppy, I finished my piece by 4:30 PM, while Alain was still working on his rough second draft. One problem for him, of course, was that he had to write the final text in English—the only language the telex operator could read. If he was back at his office (or if he was using a computer like me) he could have written the piece in his native French and transmitted it to Paris as is.

So, bidding adieu to Alain, I packed up my Osborne and peripherals, and—leaving Alain muttering his obscure French profanities—I hopped a rickshaw to my friend's house. There, I placed a call to Marty, asked him to call me back, and when he did, transmitted the text of my article in one try. Marty immediately relayed it to the *Sun-Times*, which received it at about 7:30 PM my time on April 19, or about 9:30 AM April 19 Chicago time. My article, headlined "Afghans Claim No. 1 Soviet Prisoner Killed," was run Page 2 in the afternoon edition of the *Sun-Times* that very day.

Great buckets of camel puckie! I had beat Agence France Presse to print by five hours!

What Next?

It would be wrong, of course, to imply that all journalists should immediately dump their portable typewriters and telexes and switch to computerized reporting. There are still many problems to be overcome, not the least of which is the fact that the worldwide telex system is already in place and hooked squarely into the very guts of the international news gathering community.

Other problems include the lack today of any support and service system in remote world locations for the still fairly fragile computers, and the relatively costly phone calls needed to use a modem as against a privately-owned telex (public telexes, however, are still more expensive than international telephone calls). Nevertheless, it can surely be said that the era of the portable computer as a reporter's tool is upon us. In the next few years, with the widespread substitution of flat panel displays for those cumbersome CRT screens, full-capability computers like the Osborne will no longer weigh 24 pounds, but rather will be packaged briefcase size, with the essential typewriter-style keyboards, at between

What if you're having to clean floppy drive heads too often?



Ask for SYNCOM diskettes, with burnished Ectype® coating and dust-absorbing jacket liners.

As your floppy drive writes or reads, a Syncom diskette is working four ways to keep loose particles and dust from causing soft errors, dropouts.

Cleaning agents on the burnished surface of the Ectype® coating actually remove build-up from the head, while lubricating it at the same time.

A carbon additive drains away static electricity before it can attract dust or lint.

Strong binders hold the signal-carrying oxides tightly within the coating.

And the non-woven jacket liner,

more than just wiping the surface, provides thousands of tiny pockets to keep what it collects.



- Liner collects and "pockets" loose particles
- Tightly bonded milled ferrous oxides
- Head-cleaning and anti-static agents

To see which Syncom diskette will replace the ones you're using now, send for our free "Flexi-Finder" selection guide and the name of the supplier nearest you.

Syncom, Box 130,
Mitchell, SD 57301.
800-843-9862; 605-996-8200.

Circle 288 on Reader Service card.

SYNCOM

Manufacturer of a full line of flexible media

A Division of Schwann's Sales Enterprises, Inc.

Microcomputing, July 1982 49



Momentarily trading in his arms for the latest war-reporting weapon, this Afghan guerrilla assisted journalist David Kline in transmitting his stories back to the U.S. from a guerrilla office located near Peshawar. (Photo by David Kline/Impact Features)

five to ten pounds. If a reporter would be satisfied with simply an intelligent terminal with built-in text-editing firmware rather than floppy disk drives, the weight of the machine would be reduced even further.

And with the low power generating CMOS circuitry now being widely introduced, these computers will probably come supplied with really lightweight battery packs enabling a journalist to operate even in a remote Asian battlefield, far from any power source, if that's what he's crazy enough to want to do. In other words, we're talking about true portability for computers—the ability to use a computer in any environment under any conceivable conditions.

As for communications, no longer must we wait for underdeveloped third world countries to develop cumbersome and costly ground telephone systems. The rapid proliferation of satellite-based commercial telephone systems promises to bring reliable phone service to even the most remote corners of the earth within just a few years.

All of this is not fantasy; the technology exists and is in use right now.

The task is simply to make the technology more widely available to and accepted by journalists. And in this, I'm afraid, the industry has been sadly remiss. Rarely do I even see advertisements for portable computers in our professional journals and magazines. The attitude of the marketing managers in the industry seems to be to treat all potential buyers of serious small computers as simply one big lump of undifferentiated "small businessmen."

That the commercial market may, in fact, be divided into distinct sectors—with the journalism sector, for example, having its own special needs and requirements that must be met by the industry—well, this notion does not seem to have intruded into the heady boardrooms of Silicon Valley.

Most reporters I know are keenly interested in the potential of portable computers and terminals, but suspect that somehow this technology may not be suitable for their work because no one in the industry has specifically shown them that it is. Of the major news organizations, only CBS television, as far as I am aware, has been approached about assigning portable

computers to field reporters—approached by the aggressive Osborne Computer Corp., incidentally.

What about the hundreds of thousands of telex machines currently in place around the world? No one is talking about dumping them into the trash heap of history. Some portable microcomputers, like the 20 lb. Otrona, are already capable of communicating at baud rates compatible with 50 or 110 bps telexes. It's a relatively simple matter to install interface ports on new telex models, or for a manufacturer to develop a cheap "black box" device to convert a micro's eight-level ASCII code to a telex's five-level baudot, thus offering any journalist in the world the option of transmitting computer-generated copy either by phone or telex, according to his or her desire.

Indeed, the only hold-up in creating a worldwide micro-telex network combining the best of both systems may be the fact that in most countries of the world, communications systems are under government control. Even that problem can be solved in time, however, if appropriate agreements allowing free access to such networks by news organizations are arrived at.

A final word should be said about the Osborne computer itself. Frankly, when I began the journey, I had serious doubts about its durability. The plastic case enclosing the machine is rather flimsy and highly susceptible to dents. But I'm happy to report that all the damage inflicted by arrogant customs officers, airline police, vengeful Paris bellhops and opium-fogged Pakistani cabbies was entirely cosmetic. I even kicked over the machine accidentally on two occasions, and yet it still works fine.

What can we look for in the more distant future—say, ten years from now? Voice-activated computers capable of automatically transcribing hours of interviews with either a Georgia farmer or a Boston bank president? Battery-powered portable computers weighing five pounds or less capable of transmitting articles over short-wave bands from remote world hot-spots to a waiting host in a nearby city for relay to newspaper offices continents away? As a journalist, I look to the computer technology field with great hope and expectation.

Who knows, we may even get a portable computer capable of stopping a Russian bullet! ■

WARNING!

Electric Power Pollution.
Spikes & Lightning
HAZARDOUS to
MICROCOMPUTERS!!

Patented ISOLATORS provide
protection from ...

- Computer errors caused by power line interference
- Computer errors due to system equipment interaction
- Spike damage caused by copier/elevator/air conditioners
- Lightning caused damage



Pat. #4,259,705

MONEY BACK GUARANTEE!

- ISOLATOR (ISO-1) 3 Isolated 3-prong sockets; Spike Suppression; useful for small offices, laboratories, classrooms. \$69.95
- ISOLATOR (ISO-2) 2 Isolated 3-prong socket banks; (6 sockets total); Spike Suppression; useful for multiple equipment installations. \$69.95
- SUPER ISOLATOR (ISO-3) similar to ISO-1 except double isolation & oversize Spike Suppression; widely used for severe electrical noise situations such as factories or large offices. \$104.95
- SUPER ISOLATOR (ISO-11) similar to ISO-2 except double isolated socket banks & Oversize Spike Suppression; for the larger system in severe situations. \$104.95
- MAGNUM ISOLATOR (ISO-17) 4 Quad Isolated Sockets; Multiple Spike Suppressors; For ULTRA-SENSITIVE Systems in extremely Harsh environments. \$181.95
- CIRCUIT BREAKER, any model (Add-CB) Add \$9.00
- REMOTE SWITCH, any model (Add-RS) Add \$16.00

AT YOUR DEALERS

MasterCard, Visa, American Express

ORDER TOLL FREE 1-800-225-4876 (except AK, HI, PR & Canada)

ESP Electronic Specialists, Inc.

171 South Main Street, Box 389, Natick, Mass. 01760

(617) 655-1532

Circle 93 on Reader Service card.

Circle 140 on Reader Service card.

NEW 40 TRACK DISK DRIVES with POWER SUPPLY & CASE for RADIO SHACK and OTHER COMPUTERS

\$179.00

Circle 140 on Reader Service card.

OMNITEK Computers
International, Inc.

LIMITED
SUPPLY

1300 Main Street
Tewksbury, MA 01876
(617) 851-4580

LIMITED
SUPPLY

Shipping extra FOB Tewksbury
Master Card, Visa, or Bank Checks accepted

Ride the



5 1/4" \$1.99*

SINGLE SIDE
SINGLE DENSITY
W/HUB RING

100% CERTIFIED
2 YEAR WARRANTY

SOFT,
10 OR 16
SECTORS

8" \$1.99*

SINGLE SIDE
SINGLE DENSITY

100% CERTIFIED
2 YEAR WARRANTY

SOFT
OR 32
SECTORS

5 1/4" \$2.19*

SINGLE SIDE
DOUBLE DENSITY
W/HUB RING

100% CERTIFIED
2 YEAR WARRANTY

SOFT,
10 OR 16
SECTORS

8" \$2.49*

SINGLE SIDE
DOUBLE DENSITY

100% CERTIFIED
2 YEAR WARRANTY

SOFT
OR 32
SECTORS

5 1/4" \$2.99*

DOUBLE SIDE
DOUBLE DENSITY
W/HUB RING

100% CERTIFIED
2 YEAR WARRANTY

SOFT,
10 OR 16
SECTORS

8" \$3.09*

DOUBLE SIDE
DOUBLE DENSITY

100% CERTIFIED
2 YEAR WARRANTY

SOFT
OR 32
SECTORS

- Minimum order 100 • For smaller quantities add 10%
- Packed 10 boxes of 10 diskettes with sleeves and labels
- Quantity discounts - 1,000 deduct 3%, 5,000 deduct 5%, 10,000 deduct 7%
- Add \$5.00 per case 5 1/4", \$7.00 per case 8"

For shipping and handling Continental U.S.A., U.P.S. ground.

Box of 10 diskettes: 5 1/4" 8"
OPUS ss/ss \$20 ss/ss \$21
BASIS ss/dd \$23 ss/ss \$24
MAXWELL } TOO LOW TO QUOTE CALL
DYSAN }
SPECIFY SECTORING WHEN ORDERING
5 1/4" QUAD DENSITY IN STOCK

**DISK DRIVE HEAD
CLEANING KITS**
Prevent head
crashes and
ensure error-free
operation
5 1/4" or 8" **\$19.50**

HARDHOLE DISK PROTECTORS
Reinforcing rings
of tough mylar
protect disk hole
edge from damage.
Applicators \$3 \$4
Hardhole Rings (50) \$6 \$8

SFD C-10 CASSETTES . 10/57
(All cassettes include box and labels.)
Get 8 cassettes, C-10
Sonic, and Cassette/8
Library-Album,
as illustrated,
for only **\$8**

LIBRARY CASES
8" Kas-sette/10 \$2.99
5 1/4" Mini Kas-sette/10 \$2.49

5 1/4" or 8"
Vinyl
Storage
Pages **10/\$5**

• Written purchase orders accepted from government agencies and well rated firms at a 10% surcharge (wabash media only) for net 30 billing. • International orders accepted with a 15.00 surcharge for handling, plus shipping charges. • C.O.D. requires a 10% deposit. • We accept Visa, Mastercard, Money Orders, and Certificate checks. • Checks require bank clearances. • All shipments F.O.B. San Diego. • Minimum shipping and handling 2.00, minimum order 10.00. • California residents all 6% sales tax. • Prices and terms subject to change without notice. • All sales subject to availability, acceptance, and verification. • All sales are final. • Satisfaction guaranteed or full refund.

We also offer printer ribbons, printwheels, type elements, equipment covers, power consoles, paper supplies, storage and filing equipment, furniture and many other accessories for word and data processing systems. Write for our free catalog.

Toll Free Order Only
800-854-1555

**ABM
PRODUCTS**

For Information
or California Orders
(714) 268-3537

8868 CLAIREMONT MESA BLVD.
SAN DIEGO, CALIFORNIA 92123

Circle 273 on Reader Service card.

A Printer Solution For the H89

Here's an interface package that lets you add a Centronics or Epson printer to your Heath for correspondence-quality print at a low cost.

By J.C. Hassall

Soon after my company began to use its H89 computer system, it became clear that our H14 printer was inadequate. It was fine for print-outs of engineering calculations, program listings and in-house documents, but was unsatisfactory for customer documents. Documentation, letters manuscripts and other material to be sent out must look professional.

The problem with the H14 is its 5 by 7 dot matrix. Each character must fit in a box five dots wide by seven dots high. The dots are spaced relatively far apart, and lowercase descenders are impossible. Any

lowercase letter requiring a tail is forced upward in the printed line, so the letters look peculiar and are frequently difficult to read. The resulting print font is totally unsatisfactory for general correspondence.

The easiest solution would have been to buy one of Heath's formed-character printers, either the WH44 (Diablo 1640) or the WH54 (Diablo 630). But the cost was prohibitive—\$2200 or more.

Enter Centronics

Enter the Centronics 737 line. It offers high-quality dot matrix print at a

reasonable price. But we're not out of the woods yet. The 737-1 (the least expensive and most widely available of the 737 model line) requires a Centronics parallel interface (a de facto industry standard), which the H-89 does not support, and a software driver.

Fortunately, the FBE Research Company, Inc. (PO Box 68234, Seattle, WA 98168), H89CTI Series Interface package (\$64.95 for the described package) is designed expressly to interface either the Centronics model 737 or the Epson model MX-80 printers (the interfaces differ slightly) to the H-89/Z-89 with little or no modification of the computer. The interface is configured to operate on the right-side internal H-89 bus, with no modification required. If you want to install it on the left-side bus, the package comes with a cable assembly and explicit directions to do so (see Photo 1).

The interface is user-friendly and is accessed as easily as the LP.DVD device driver for the H14 line printer. Also, the device driver allows dynamic control of the various printer features under software control. The CT: device driver included on the disk provides full access to all of the printer's features:

- underscoring
- elongated, proportional, condensed or standard print fonts
- subscripting and superscripting
- backspace
- half or full, forward or reverse line feeds

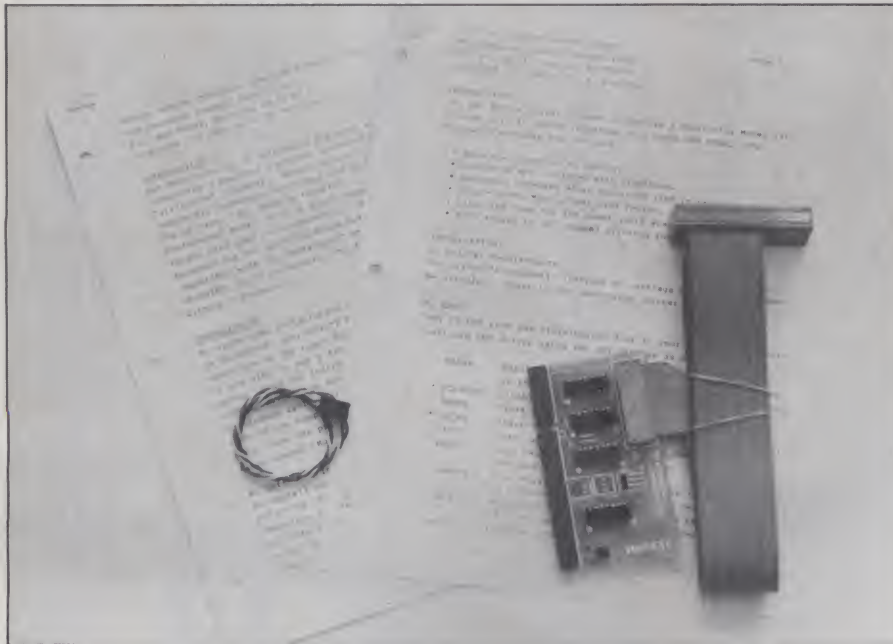


Photo 1. This photo shows the hardware and documentation portion of the interface package. Not shown is the 5 1/4-inch disk on which the software is provided. The small cable is used only in the event that the interface is installed on the internal left-side bus. The jumpers on the printed circuit board are only modified in the event that the interface is installed in a nonstandard configuration. The instructions shown provide excellent documentation on any modifications necessary.

Address correspondence to J.C. Hassall, H & H Enterprises, PO Drawer H, Blacksburg, VA 24060.

TOGETHER, LOCKSMITH™, THE INSPECTOR™ AND WATSON™ GIVE YOU TOTAL CONTROL OF YOUR APPLE AND ITS DISKS.



Our new 4.1 version is by far the most reliable nibble-copy program for the Apple. There simply *is* no competition. Allows you to backup just about *any* diskette. Includes read/write Nibble Editor, Quickscan Analysis, Media Surface Check, Degauss and Erase, Inspector Interface and Disk-drive Speed Calibration utilities. All for just \$99.95 at your local dealer or direct.



Puts all your disk and memory utilities together where they belong — *inside* your Apple. Eprom or disk version is always at your fingertips. Search

memory and disks forward and backwards, read nibbles, map disk space, locate strings, the uses are endless. At your local dealer or direct — THE INSPECTOR, \$59.95.

Watson™ Includes such goodies as scrolling screen dump, disassembler that shows ASCII, file follower of file, track/sector list-finder by *name*, disk-sector lockout, disk comparer, much more. At your local dealer or direct — WATSON,* \$49.95.

If you're at all serious about programming or about business use of your Apple, you must have these interactive utilities. MasterCard and Visa holders order toll-free, 1-800-835-2246.



OMEGA MICROWARE, INC.™

222 SO. RIVERSIDE PLAZA • CHICAGO, IL 60606 • 312-648-4844

*Requires The Inspector

Apple is a registered trademark of Apple Computer, Inc.

1 + 1 + 1 = 4

3 PRODUCTS TO ADD A 4TH DIMENSION OF POWER TO YOUR APPLE.

RAMEX-16™

(Look Ma, no straps!)

The one 16-K memory expansion card for your Apple that *requires no unnecessary surgery*. This board just plugs in with no strap or additional connections. In spite of its quality, the Ramex-16™ costs just \$139.95, complete with a *one year* limited warranty.



A complete turnkey memory management system on a disk — using either one or two 16K cards. HIDOS™ loads DOS onto one RAM card and with the second card loads an alternate language onto another. SOLIDOS™ turns a 16K card into a fast,

45-sector disk-drive emulator. At your local dealer or direct for just \$34.95.



If you use VisiCalc™, then you must have THE CONSOLIDATOR. It will save you hours of keyboard time, by allowing you to manipulate totals of separate files *without reentering them*. Easy to use, invaluable to own. Just \$49.95 at your dealer or direct.

All three of these together help make your Apple a more complete business system — giving you expanded memory, extra convenience, sure control. MasterCard and Visa holders order toll-free, 1-800-835-2246.



OMEGA MICROWARE, INC.™

222 SO. RIVERSIDE PLAZA
CHICAGO, IL 60606
312-648-4844

Circle 201 on Reader Service card.

Apple is a registered trademark of Apple Computer, Inc.
VisiCalc is a registered trademark of Personal Software, Inc.

Printer Control Functions

An ESC character is sent to the printer whenever a tilde (~) character is found in the text. Hexadecimal 40 is subtracted from the character code following the tilde before it is sent to the printer. These sequences are available:

- ~A Move the print head 1 dot space to the right
- ~B Move the print head 2 dot spaces to the right
- ~C Move the print head 3 dot spaces to the right
- ~D Move the print head 4 dot spaces to the right
- ~E Move the print head 5 dot spaces to the right
- ~F Move the print head 6 dot spaces to the right
- ~J Full line feed reverse
- ~N Start elongated print
- ~O Stop elongated print
- ~Q Select the proportional character set
- ~S Select the standard character set (10 CPI)
- ~T Select the condensed character set (16 CPI)
- ~\ Half line feed forward
- ~A Half line feed reverse

Direct ASCII Control Characters

The driver processes only the TAB, LF (line feed), and FF (form feed) control characters. All other control characters are sent directly to the printer. This capability allows Backspace to be used. Sending control sequences directly to the printer can confuse the driver's tab, form feed and underscore logic.

Table 1. This table shows the control codes for the CT: device driver and their associated functions.

The device driver has the following features:

- tabs are converted to spaces
- form feeds are simulated with line feeds
- automatic form feed after specified line is printed
- single sheet or continuous sheet mode
- lines too long for the paper width wraparound
- full access to all special printing functions

In addition, there are extensive driver set configuration options: PAUSE—enables the single sheet mode. The printer pauses at the top of each new page to allow operator paper handling.

NOPAUSE—disables the single sheet mode (as supplied).

PROPO—starts up in the proportional print font.

10CPI—starts up in the standard print font (ten characters per inch).

16CPI—starts up in the condensed print font (16 characters per inch).

PORTn—sets the base port to the octal value n. As delivered, the base port is 320Q (SERL 0).

LENGTHn—sets the page length to n lines, where the range of n is 4 through 127. As delivered, n=66 lines.

LASTn—sets the last line printed to n where the range of n is 4 through 127. As delivered, n=60th line.

HELP—prints a list of SET options.

The LAST line is followed by an

automatic form feed. If LAST is set greater than LENGTH, no form feed will occur. In this configuration, the printer responds as if roll paper is being used, so that there is no page demarcation (the printout is continuous).

The control characters recognized by the driver and the resultant operations are shown in Table 1. Control characters other than those recognized and responded to by the device driver are sent directly to the printer, although doing so will confuse the device driver's control logic. The problem arises because control characters will be counted as printable characters, so the tabs, form feeds and underscores may be performed incorrectly. However, it is fortunate that control characters are sent to the printer, rather than being discarded, because you can then fully use the abilities of the printer (subscripting, for example). That also lets you upgrade the printer without having to upgrade the device driver. In our case, we have a Centronics 739 rather than a 737. The device driver still performs as designed, even though the printer is not the one for which the driver was designed.

Installation

The installation instructions included with the interface are excellent (written instructions and hardware included with the driver package are shown in Photo 1). The

H-89 has two buses: the right side and the left side. The right-side bus seems to have been designed for I/O (input/output) expansions, while the left side seems to have been intended for memory expansions.

Installation of the interface on the right-side bus is simple; all you need to do is insert the interface board. Installation on the left-side bus is somewhat more involved, but is certainly not beyond the abilities of anyone who has built any electronic projects. In the case of the left-side bus, the instructions cover almost two pages in a sequential, step-by-step manner. If you follow the instructions, there is almost no chance of making a mistake. Check-out instructions are also included to ensure that the modification to the computer does not adversely affect the computer.

We installed the interface on the left side to allow maximum I/O expansion of our system, and to check the worst-case installation of the interface. As seen in Photo 2, modification to the computer for installation on the left-side bus consists mainly of attaching the three-conductor cable (seen in the photo between the memory chips in the upper center) to the right-side bus and routing it to the interface. Installation time was less than one-half hour from start to finish.

Instructions are included to let you hardware-configure the interface to any of the already decoded ports. A table that gives all information necessary to select and configure the interface for the desired port is included. The software portion of the driver is then reconfigured for the desired port using the Set program, as covered above.

The instructions state that systems with the H-88-7 upgrade ROM kit installed cannot use the cassette port. While that is strictly correct, the authors could have *told the user that* if the Z-47 eight-inch disk drive accessory is not installed, and is not intended to be installed, then U550 (Heath part number 444-61) could be replaced with the old U550 (Heath part number 444-43). That modification would then let you use the cassette port. That insufficiency of information aside, the documentation included in the interface package is excellent. As seen in Photo 1, the amount of written documentation included with the package is excellent.

The astute reader has probably

Peripherals Unlimited...

FANTASTIC PRICES!

OUR FAST SERVICE, PRODUCT SELECTION AND OUR CUSTOMERS' SATISFACTION MAKE US #1.

ZENITH

Z-89-48K	\$2299
Z-90-64K DO	\$2588
Z-19 Terminal	\$777
Z-121 Monitor 12"	\$149

ATARI COMPUTERS

Atari 800 16K	\$669
Atari 400	\$318
Atari Interface Module	\$174
Atari 810 Single Disk	\$444
Atari 815 Dual Disk	TBA
Atari 830 Modem	\$166
Programmer	\$59
Entertainer	\$84
Star Raiders	\$34
16K Mem. Exp. for Atari	\$74
32K Mem. Exp. for Atari	\$114

NEC PRINTERS

7710/30 Spinwriter R/O	\$2279
7720 Spinwriter KSR	\$2649
3510/30 Spinwriter R/O	\$1699
3500 Serial Spinwriter	\$1599

NEC DOT MATRIX

PC-8023	\$474
---------	-------

Call for prices on ribbons, etc.

MORE PRINTERS

Anadex 9500/9501	\$1295
Anadex DP-9000	\$1049
Okidata Microline 80A	CALL
Okidata Microline 82A	CALL
Okidata Microline 83A	CALL
Tractor (OKI 80 + 82 only)	\$60
Diablo 630	\$2044

MONITORS

Sanyo 12" GRN Phosphor	\$266
Sanyo 12" Black + White	\$239
Amdek 12" 300 GRN Phosphor	\$149
Amdek 12" Color	\$319
NEC 12" GRN Phosphor	\$164
NEC 12" Color	\$344

EPSON PRINTERS

MX-70	CALL
MX-80 w/Graphics	CALL
MX-80 FT (Friction + Tractor)	CALL
MX-100 (15" Carriage)	CALL

Call for prices on
Ribbons, Cables and Interfaces

NEC-PC 8000

Series Microcomputer

PC-8001A Computer w/32K	\$888
PC-8012A w/32K + Exp. Slots	\$588
PC-8031A Dual Mini Disk	\$888
PC-8032A Add-on Mini Disk	\$777

Call for Software Prices

**FOR THE LOWEST
PRICE CALL
TOLL FREE
1-800-343-4114**

ORDERING INFORMATION

Our order lines are open 9AM to 6PM EST Monday thru Friday. Phone orders are welcome; same day shipment on orders placed before 10AM. Free use of Mastercard and VISA. Personal checks require 2 weeks clearance. Manufacturer's warranty included on all equipment. Prices subject to revision. C.O.D.'s accepted.

For service, quality and delivery call:

**PERIPHERALS UNLIMITED
(617) 655-7400**

62 N. Main St. • Natick, MA 01760

Circle 19 on Reader Service card.

questioned how Table 1 was created. The actual control characters are printed, even though, as control codes, they would be nonprinting.

The answer is obviously that the driver was modified to use different control characters; then the table was printed. Not possible without the

source code, you say? Exactly right—the source code is included with the driver. When was the last time you bought a software package that included the source code at no extra cost?

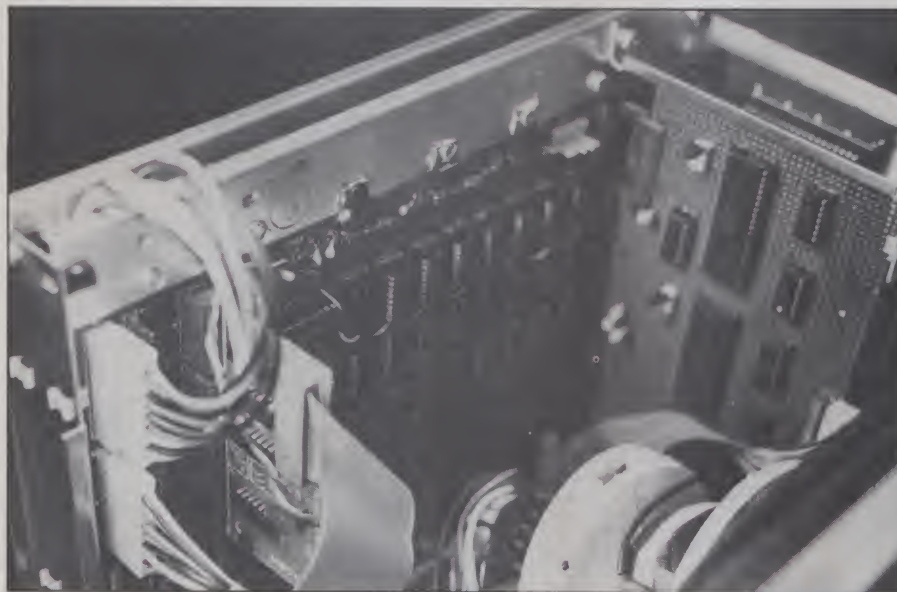


Photo 2. This photo shows the interface installed on the left-side bus. The small three-conductor cable is shown between the upper banks of memory chips. It was later tacked down with silicone cement to prevent movement. Observant readers will notice the jumpers on the printed circuit board that must be cut for left-side installation have not yet been cut.

Having access to the source code lets users with some assembly language experience modify the driver for custom applications. Having access to the source code in this case is particularly nice if you wish to learn more about Heath device driver code; the source code is very well documented, to the extent that a perceptive programmer could use this code as a basis for a completely different driver. Also included on the disk are the .LST file, the .DVD file (of course) and a test file that can be output directly to the printer to test for proper printer and driver functioning.

In our case, having access to the code lets us use the driver with Heath's AutoScribe word processor package. AutoScribe does not recognize the tilde (~) character, so consequently the first time the driver was used with AutoScribe, the Centron-

Circle 101 on Reader Service card.

Give Your TRS-80* a Tremendous Boost with RACET COMPUTES Software

RACET COMPUTES Utility Software makes the TRS faster, more efficient, and easier to use. Our programming aids improve your productivity. Our reputation is for products that are professional in design and work as advertised!!!

FIELD PROVEN HARD DISK DRIVES AND OPERATING SYSTEM

Now you can use RACET's Hard/Soft Disk Operating System (HSDS) with the ARM Winchester Disk Drive on the Model II. This cost effective combination provides 15 Megabytes per drive including ECC Error Correction Code and an advanced sequencer to further ensure data integrity. An incremental backup to floppy is provided so that only those sectors that were changed from the last backup are saved. A full monthly service contract is available at \$30 per month per drive.

The HSDS Software has more than One Year's FIELD Experience. The latest HSDS version adds several enhancements including maintenance of system files on the hard drive, files as large as the disk, the ability to segment the disk as logical drives, definable directory size, and many utilities including bulk copies between floppy and hard drives, multiple purge, Superzap, and Directory Catalog System. Full program compatibility with TRSDOS 2.0a is maintained. Mixed floppy and hard drive operation is supported.

HSDS is available for the Cameo, Cynthia Bull, Corvus, Data Peripherals, and Santa Clara Systems hard disk systems as well as the ARM Winchester Drive.

ARM 15 Megabyte Drive Subsystem \$3895. HSDS Software \$400.
Cameo 5/5 Cartridge Drive \$5995. Cynthia Bull 10/10 Drive \$7995

NEW PRODUCT ★ Model II Fast Backup Utility ★ \$75

5 to 10 times faster backups!!! Full disk backup (including verify) 55 seconds!!! on two drive system — 2 15 on single drive system. In business, time is money, and one BACKUP is worth 1000 tears!!

NEW PRODUCT ★ INTEGRATED BUSINESS SYSTEM ★

ISAM File Structure — Multi-Company Capability. Modular structure. Each module includes complete user documentation which guides the user through installation and allows "practice" using a sample data base. When ready, the user simply names his data base and begins. The Integrated Business System program set includes General Ledger, Accounts Receivable, Accounts Payable, Payroll, Inventory, General Journal, Asset Management and more.

Business Programs \$250/module Mod III, \$300/module Mod II, \$795 for all four Mod III, \$995 for all four Mod II. General Ledger and Accounts Receivable available now. Accounts Payable and Payroll 1st Quarter 1982.

RACET COMPUTES LTD.
1330 N. GLASSSELL, SUITE M, ORANGE, CA 92667

CIRCLE READER RESPONSE BELOW FOR FREE CATALOG

*TRS 80 IS A REGISTERED TRADEMARK OF TANDY CORPORATION

CHECK VISA M/C C.O.D. PURCHASE ORDER
TELEPHONE ORDERS ACCEPTED (714) 997-4950

Circle 82 on Reader Service card.

MICROSTAT® - Release 3.0

MICROSTAT® + baZic® = PERFORMANCE

The best just got better! MICROSTAT has been the leader in the statistics field for microcomputers since 1979, and the new release 3.0 outperforms and is noticeably faster than previous versions. Just a few of the features include:

GREATER ACCURACY

BCD with up to 14 digit precision;

PROGRAM ENHANCEMENTS

Missing data capabilities and many more;

FASTER EXECUTION

Calculation time greatly reduced;

DYNAMIC FILE ALLOCATION

Data can be inserted, added, or deleted;

SPECIAL PRICE:

For a limited time get MICROSTAT plus baZic complete with program disk and documentation for each for \$395.00, save \$50.00!

The MICROSTAT - baZic version requires: a Z80 CPU, CP/M™ and 48K of memory. Available formats: 8" SD disk or 5¼" North Star only. Check with your dealer for other formats. Also available for: Microsoft's Basic-80™, North Star DOS and IBM. For more information, call or write:

ECOSOFT INC.

P.O. Box 68602
Indianapolis, IN 46268-0602
(317) 255-6476



MICROSTAT is a registered trademark of ECOSOFT, INC.
baZic is a registered trademark of MICROMIKES, INC.
CP/M is a registered trademark of DIGITAL RESEARCH
Basic-80 is a registered trademark of MICROSOFT

ics 739 did not respond to any commands to change print font, etc. Changing the driver to function with AutoScribe took about five minutes. Pretty impressive.

Potential Problem

While the package is professionally designed and supported (the people at FBE have been very receptive to our questions about their source code), it is not without a potential problem (at least as far as we're concerned). The Centronics can print with the proportional print font, in which each character is spaced at a proportional distance with respect to the preceding character. That implies that each character has a different number of dot columns associated with it. For example, an "a" has 12 dot columns associated with it while a "z" has only ten. Therefore, any software that assumes that all characters are equally formed and spaced will have problems maintaining proper location of tabs, among other things. In my opinion, a device driver should maintain proper tab spacing irrespective of the print font. The CT:

device driver has been modified by others to handle proportional tabs.

A tribute to the interface is the fact that at least one word processor package has been written expressly for the FBE Research interface and the Centronics 737 printer. That particular software package makes excellent use of the flexibility of the interface/printer combination.

That problem notwithstanding, the device driver package is excellent. The software is designed primarily to operate under HDOS (the Heath Disk Operating System). A patch is available to Heath's CP/M BIOS (Basic Input/Output System) for users operating under CP/M. Installation of the patch is straightforward and well-documented. The patch does not support all of the sophisticated control codes that the HDOS device driver does, however. It simply lets CP/M talk to the printer in the standard print font (10 cpi). In word processing applications, the word processor software must include the capability to output control codes directly to the printer in order to make full use of the printer's features. We also use Heath's Magic Wand, which outputs

control codes directly to the printer.

Any H-89/Z-89 system that requires correspondence-quality print would certainly benefit from this driver. Of course, the actual quality of the print is solely dependent upon the printer used. If you're going to buy a Centronics 737 or 739 or an Epson MX-80, FBE Research has developed a very professional device driver that is exactly what the integrated system requires.

To overcome the shortcomings of the CP/M software patch, my company has improved the patch programs for the Centronics and Epson printers to let the user program the print font automatically at cold boot time (or any other time, by running the program from the keyboard) for the system. Now, instead of having to settle for the standard (10 cpi) print font, any print font may be selected. The improved patch programs are available from H & H Enterprises, PO Drawer H, Blacksburg, VA 24060, for \$5 plus \$1.50 shipping and handling. Interested readers should send their FBE Research distribution disks, to which the programs will be added and returned.■

QUALITY SOFTWARE FOR TRS-80 COLOR AND OSI



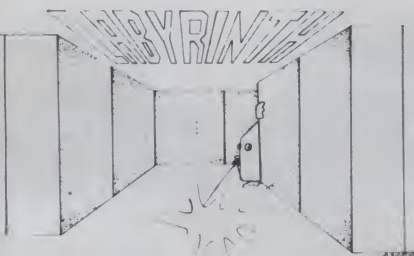
QUEST — A NEW IDEA IN ADVENTURE GAMES! Different from all the others. Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time.

16K COLOR-80 OR TRS-80 or 12K OSI.
\$14.95.

BASIC THAT ZOOOMMS!!
AT LAST AN AFFORDABLE COMPILER FOR OSI AND TRS-80 COLOR MACHINES!!! The compiler allows you to write your programs in easy BASIC and then automatically generates a machine code equivalent that runs 50 to 150 times faster.

It does have some limitations. It takes at least 8K of RAM to run the compiler and it does only support a subset of BASIC—about 20 commands including FOR, NEXT, END, GOSUB, GOTO, RETURN, END, PRINT, STOP, USR(X), PEEK, POKE, *, /, +, -, X, X, =, VARIABLE NAMES A-Z, A SUBSCRIPTED VARIABLE, and INTEGER NUMBERS FROM 0-64K.

TINY COMPILER is written in BASIC. It generates native, relocatable 6502 or 6809 code. It comes with a 20 page manual and can be modified or augmented by the user. \$24.95 on tape or disk for OSI or TRS-80 Color.



LABYRINTH — 16K EXTENDED COLOR BASIC — With amazing 3D graphics, you fight your way through a maze facing real time monsters. The graphics are real enough to cause claustrophobia. The most realistic game that I have ever seen on either system. \$14.95. (8K on OSI)



VENTURER!—A fast action all machine code Arcade game that feels like an adventure. Go berserk as you sneak past the **DREADED HALL MONSTERS** to gather treasure in room after room, killing the **NASTIES** as you go. Great color, high res graphics, sound and Joystick game for the TRS-80 Color or OSI machines. (black and white and silent on OSI.) Tape only. \$19.95.

AARDVARK - 80

2352 S. Commerce, Walled Lake, MI 48088

(313) 669-3110

Circle 91 on Reader Service card.

TRS 80 COLOR

OSI

Numeric Storage— As Easy as 1,2,3 . . .

*This programming technique
(that will work in most dialects of Basic) comes in handy when
you have to store integers in disk or tape data files.*

By Ken Knecht

Here's a way to let you store integers from 0 through 255 in a single byte or integers from 0 through 65279 in two bytes. This technique is especially useful for storing integers

in disk or tape data files. A modification of the technique shows how negative integers can be stored as well.

Normally, you use at least two bytes to store an integer up to 255, us-

ing MKI\$ to convert the integer to a two-byte string and CVI to get the number back. Even this won't help if you don't have these commands or their equivalent available, in which case you need three bytes for each integer, more if you had to use delimiters between the numbers.

You could convert the integer to binary and store it that way, but that takes a lot of effort to convert back and forth. It's also awkward to use, usually requiring peeks and pokes to the program or string storage area.

This simple method will work in most Basics. All you need are the CHR\$ and ASC commands. These (or their equivalents) are included in most Basics.

The CHR\$ command converts any integer from 0 to 255 to a one-byte string; for example,

A\$ = CHR\$(65)

The ASC command will convert any character or the first character in a string to an integer from 0 to 255; for example,

A = ASC("A")

or

A = ASC(A\$)

Normally these commands are used to deal with ASCII values of characters, but I discovered another way to use them.

Listing 1 contains an example of a

```
10 PRINT 0, 10, 100, 255
20 A$=CHR$(0): B$=CHR$(10): C$=CHR$(100): D$=CHR$(255)
30 E$=A$+B$+C$+D$
40 PRINT LEN (E$)
50 PRINT ASC(MID$(E$,1,1)), ASC(MID$(E$,2,1)), ASC(MID$(E$,3,1)),
  ASC(MID$(E$,4,1))
60 END
>RUN
0          10          100          255
4
0          10          100          255
```

Listing 1. Sample program using the compressed integers technique.

```
10 A$=CHR$(INT(60000/255)): B$=CHR$(60000-INT(60000/255)*255)
20 C$=A$+B$
30 PRINT ASC(MID$(C$,1,1))*255+ASC(MID$(C$,2,1))
40 END
>RUN
60000
```

Listing 2. Storing 60000 in two bytes.

Address correspondence to Ken Knecht, 1340 W.
3rd St., Yuma, AZ 85364.

program using my technique.

The 4 printed by line 40 proves the four integers are stored in only four bytes. The results of line 50 show that the integers can be reclaimed from the string E\$ in their original form.

Let's say you wished to store the monthly inventory turnover for 12 months of each item in an inventory list. The maximum turnover would be limited to 255. Using MKI\$ and CVI, this would take 24 bytes, two for each month. Stored as numeric strings, as with some Basics, this would take at least 36 bytes, three for each month. Using the compressed integers you'd only have to store a 12-byte string for all 12 months.

If you have 5000 items of inventory this could save 60,000 bytes, or even 120,000 bytes or more if you had to store the integers as numeric strings. That's a lot of storage space!

You could also use this technique to store integers from 0 to 65279 in two bytes. Listing 2 contains an example of how to store 60000 in two bytes.

This could save up to three bytes per integer stored. Note the MKI\$ and CVI commands limit you to

32767 as the largest positive integer.

As mentioned earlier, these techniques are mainly useful for storing integers in disk or tape data files; but when you have a lot of suitable integers to store, they can save a great deal of space.

The main disadvantage is that these techniques won't handle negative integers without cutting the maximum integer size in half and using extra program statements. For example, Listing 3 shows how to store

an integer from -127 to 127 in a single byte.

Get the idea? I'll leave it to you to work out a method for storing integers from -32639 to 32639 in two bytes. It can be done!

In all the program examples I concatenated the individual single-byte strings into a single string variable and used MID\$ to break the string down again. This isn't necessary but makes handling a group of one- or two-byte strings easier. ■

```
10 A=120: B=-120
20 A$=CHR$(A+127): B$=CHR$(B+127)
30 C$=A$+B$
40 A1=ASC(MID$(C$,1,1)): IF A1<127 THEN A1=-127+A1 ELSE A1=A1-127
50 B1=ASC(MID$(C$,2,1)): IF B1<127 THEN B1=-127+B1 ELSE B1=B1-127
60 PRINT A1, B1
70 END
>RUN
120      -120
```

Listing 3. Storing an integer from -127 to 127 in a single byte.



CPU

4 MHz Z80A CPU

Disk Storage

Dual 8" floppies—2 megabytes
8" hard disk—10, 20, 30, or
40 megabytes

MEMORY

2K EPROM
200 nsec. RAM
Bank switchable
64K bytes single user
256K bytes multi-user/task

Real-time Clock

Hours, minutes, seconds
Day, month, year
Software settable
I/O

12 bits parallel I/O
Serial I/O—software selectable
Two RS-232C ports single user
Six RS-232C ports multi-user/task

Operating System—CP/M* or IOS†

Multi-user/task: Multi-OS†
Upward compatible with CP/M*

Language

CBasic -2

Golden West Computers

Series 999 Fills the Gap in Business Systems

The Golden West Computer Family allows you to plan for the future with your very first system.

The Series 999 system is the state of the art in single user systems, designed for dependable performance. Reliability is built into each system at every stage of assembly.

The Golden West family of small business systems was modularly designed with expansion in mind. Multi-user and/or hard disk, for example, will fit right into your present system. Sudden obsolescence has become obsolete.

180 day limited warranty
Dealer Discounts Available
Golden West Computers, Inc.
60 N. 300 W., Provo, Utah 84601
Telephone (801) 377-2177

Circle 392 on Reader Service card.

*Trademark of Digital Research
†Trademark of Infosoftware

How Safe Is Your Software?

Copy protection schemes are, for the most part, ineffective against unauthorized duplication. Thwarting software-thirsty pirates calls for a change in modern microprocessor design.

By Jake Commander and G. Michael Vose

Microcomputing Technical Editors

Software pirates, brandishing the machine-language monitors, disassemblers and bit copiers that are the keen-edged tools of their trade, are a computer programming entrepreneur's nemesis. Sallying forth to engage the beleaguered programmer's every effort to protect the island of his precious creations, the pirate seems to relish the challenge of being the first to penetrate the secrets of any software protection scheme. In this quest, the software pirate, and many programmers, may be playing the ultimate adventure game.

Microcomputer programmers, being reasonably bright, sometimes even brilliant, have devised hundreds of schemes to protect their software. These schemes cover a range including the simple, the crafty or unexpected and the exhaustive. Many employ some hardware or take advantage of some peculiarity of the machine they

work with. All are ultimately futile.

Regardless of how you feel about the issue of software protection, you may be interested to learn some of the techniques most commonly used. This survey of copy protection schemes won't attempt to catalog all of the ideas invented to date; neither will it attempt to show you how to break any given copy protection technique. It will, however, show why copy protection of microcomputer software can never be foolproof. That goal, desirable or undesirable, depending on your perspective, will probably have to wait for a new generation of microprocessor.

Why Protect Software?

A copy protection scheme is simply a technique employed by a programmer to render a software product uncopyable. Many programmers and software vendors use these tech-

niques to prevent the unauthorized duplication of software that costs substantial sums to develop.

Uncopyable software is a vendor's dream but very often a user's nightmare. Since software is vulnerable to destruction from unexpected sources, users like to have multiple copies of a software product available. Therein lies the software copy protection dilemma.

There are ways to overcome this dilemma. Vendors can sell multiple copies at the original sale, replace damaged disks at cost or build in copy protection schemes that allow a finite number of copies to be made. These arrangements can satisfy the average software user.

The real headache for the software vendor, however, is that no software is completely protectable. Therefore, anti-copy schemes will anger some legitimate users while imposing only a minor obstacle to the dedicated protection device buster. In this way, software protection devices are like stone feathers on the wings of the vendor.

Copy Protection Schemes

Copy protection schemes fall into four broad categories: hardware dependent, load format alteration, software that checks the environment as it executes and software that executes through a "filter." Schemes from all of these categories involve an interaction of software and hardware—that's their ultimate vulnerability.

Anywhere software is used, the microprocessor is brought into the picture. Microprocessors, wonderful creations that they are, are simple,

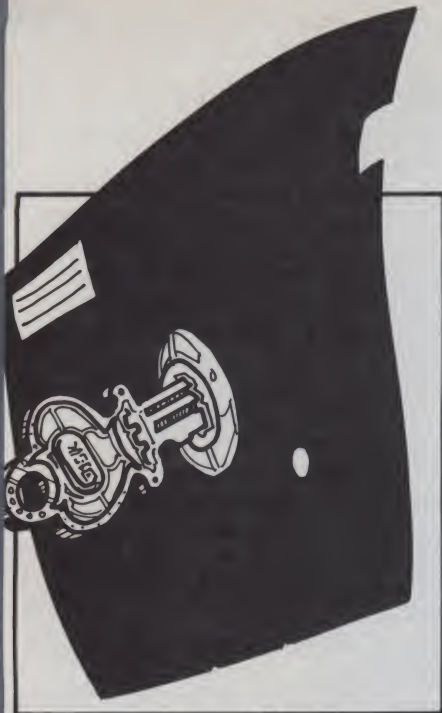
Risk-Free Program Buying

A unique method of encryption to curb unauthorized copying of programs has been developed by Soft-Link of Los Altos, CA. Soft-Rack is a take-home software demonstration package that lets the buyer sample the applications software on his own system, without paying the full price of an expensive program in advance.

The customer can purchase and preview the basic demonstration package for about \$50. If the customer decides to purchase the

package, he makes full payment for the unlocking code.

Soft-Rack relies on a software lock to protect the master program disk. Applications programs can only be unlocked by a coded key furnished by the vendor to the buyer. This reduces the risk of buying an expensive program that does not function as anticipated, or is unsatisfactory for some other reason that could have been missed during an in-store demonstration. ■



faithful executors of instructions. There are many ways to intercept those instructions.

Loading format alteration schemes are the most prevalent form of copy protection. They work with cassette tape and floppy disks. They use a simple conceptual technique. Most microcomputers load information from magnetic media using machine-language routines contained in read-only memory (ROM). These routines can be used to load a special, non-standard loader from tape or disk, which can then be used to load a program.

The program itself would be written so that it would load only using the non-standard format. For example, many tapeloading routines perform checksum operations which merely add together the value of the bytes (characters) in a record as they load into memory and check this sum against the last byte in the record which contains the sum. If the two numbers match, loading proceeds to the next record; otherwise, an error is generated. Altering the reading of the checksum can "fool" the microprocessor and make a tape copyable but unloadable.

Altering the format of floppy disks can be as simple as adding an extra track (a 41st track to a 40 track disk, for example) or leaving an unformatted track in the middle of the disk. The first information loaded from the disk would be a special loader; then

the program would be loaded using the special loading routine, a routine which would look for certain special conditions such as the 41st track. A copied disk would not have a 41st track and would therefore be unloadable.

This process can be carried to multiple levels; one programmer devised a "nesting loader" scheme that loaded a special loader from the disk which loaded another special loader which loaded the program. All of these loading format alteration schemes can be broken, however, because the first information loaded is the code of the non-standard loading routines. This code can be disassembled and analyzed, and the scheme can then be figured out so that the pirate can overcome any alterations to the format.

Hardware protection commonly involves attaching a device to an addressable port on the machine. The software is then written so that the first thing the program does is check the port to see if the proper device is attached—if it's not, access to the program is denied. Once again, however, software dependency is built into such a system, so it can be broken.

Most other hardware-related protection schemes rely on some peculiar trait of the computer being used. Apple computers, for example, allow floppy disk information to be written on the boundaries between tracks, a good place to hide a key byte or routine without which a program cannot be loaded.

Atari computers let you set a byte that makes a warm reset operation actually perform a cold reset—which zeroes memory. Software protected by this device is the only information that can be in memory—any attempt to load monitors before or after the program is in memory clears the memory. This device is hardwired into the Atari, which makes it nearly foolproof.

Atari video games contain hardware specifically designed to make software piracy impractical. Using esoteric and seldom-used components, the hardware has been modified to execute instructions in a non-traditional manner. The instruction set may have been encrypted so that a call performs a jump or a load register operation—only Atari knows for sure. The scheme could be decoded, given enough time, money and an encryption computer, but the process would hardly be worth the effort.

The other major software protection techniques involve a tremendous processor overhead. They require that the processor check the environment as the program runs; as a result, they slow the program down substantially. These kinds of schemes can use a processor's interrupts to periodically intercept program flow to vector to an obscure memory location, check a byte and then return to the program at the next instruction after the interrupt.

Basic programmers have access to some simple but effective copy protection schemes. These techniques usually involve disabling break and reset routines so that once the program is loaded, access to the system level of the machine is denied. Basic programs can contain embedded tabs or control codes that make a program's code unlistable.

Many disk operating systems also provide protection levels that can be invoked to prevent access to a Basic or machine-language program through the operating system. Access can be obtained, however, by entering the user memory using a machine-language monitor.

Another protection scheme available to the sophisticated Basic programmer is the ability to save Basic programs under system format with predefined variables. This technique involves placing a key variable in the code, saved by a special utility, that would not appear in a listing of the program. This variable could be used in a vital routine that would cause the program to crash if it were absent. Therefore, any copy made using Basic I/O routines would not run properly.

To Protect or Not to Protect

Copy protection schemes are likely to be with us for some time because software vendors and programmers have a vested interest in keeping unauthorized duplication to a minimum. Copy protection can be useful because many consumers are not technically sophisticated enough to break the protection being used. But there will always be an elite group of users who will break a copy protection scheme because of the challenge involved, and then give away copies of the software to prove their skill and cunning.

Is there no foolproof way to protect software? Mainframe computers have for many years contained processors that make protection easy.

Why can't micro manufacturers come up with similar devices?

The historical situation dictated during the evolution of modern semiconductor devices that space on a chip was at a premium. Designers were concerned with developing processors that worked, yet could still be accommodated on a single chip; furthermore, the design had to permit mass production. Early four-bit microprocessors evolved, as a result, with the minimum circuitry that still allowed the device to work.

When eight-bit processors were developed, once again only the minimum circuitry was added. No one worried about circuitry that could be used for software protection; that was "bells and whistles," which de-

There will always be
an elite group of users
who will break a
copy protection scheme
because of the challenge involved.

signers opted to ignore.

From the perspective of 1982, it is obvious that the designers of the early processors erred a bit on the side of conservatism; subsequent designers followed their lead. All that really is necessary to add hardware-depen-

dent software protection to microprocessors is an additional register pair and circuitry to produce a master/slave relationship between system software and application software.

In mainframe computers, the master/slave relationship works like this. Memory is partitioned into uniquely addressable sections. This partitioning is done by the central processor according to what memory is available. The processor uses two special registers to store the top and bottom addresses of a memory partition while it is accessing that partition. This partitioned memory is accessible only by the computer's operating system, and only when the computer is in master mode. Monitors or disassemblers can be used to access the code in any memory partition as long as the machine remains in master mode.

At some point, however, the operator decides to switch the system into its slave mode. Once this switch is made, each memory partition becomes an island unto itself. Control cannot be passed from one memory partition to another. If a program attempts to address memory locations outside its partition, an error message will be generated and, in some cases, the programs attempting the illegal access will be thrown out of memory.

To use this kind of master/slave system, the manufacturer of the microcomputer system (and those developers willing to pay for the privilege) would be the only users who had access to the operating system in master mode. The majority of users would buy the system with an operating system in slave mode. Therefore, they could run programs but not copy them unless the program they were using had a copy routine built in. Certain operating system utilities could have limited access to memory partitions outside of the one in which they resided with special permission from the operating system (i.e., the manufacturer).

This kind of master/slave design can be incorporated into the design of modern microprocessors. In fact, it is surprising that the latest generation of processors do not contain this capability. Until they do, there will always be a pirate, sword in hand, ready to chop his way into the bowels of the machine looking for the key to unlock the door to the treasure—the "protected" piece of software. ■

Circle 375 on Reader Service card.

What's a SemiDisk?™

The best disk emulator you'll find anywhere. It's a single 512K byte memory board. (1 Megabyte on special order) It operates like a disk, except far faster. Your software is compatible with no modifications.

No strings attached. No need for a special CPU, DMA, I/O, or disk controller. No need to return your operating system disk. No changes to your present hardware.

SemiDisk doesn't interfere with memory space, which is left totally free for the operating system or user programs. If you have an 8080, 8085, or Z80 CPU with CP/M 2.X on S-100, you can use it right now. (Available soon for TRS-80 Model 2 and IBM Personal Computer.)

Unmatched Performance:

- 30 to 300 times faster than 8" floppies
- Much faster than hard disks
- Expandable to 8 Megabytes
- Only 0.6 amps (typ) supply current for 512K (0.9 amps for 1 Megabyte)

SemiDisk is the least expensive disk emulator per byte of storage. At \$1995 for 512K, it's less than a third the cost of the closest competition.

So compare price, performance, hardware requirements, flexibility, storage density, and expandability, and you'll select SemiDisk!

**SemiDisk
Systems**

P.O. Box GG
Beaverton, OR
97075

(503)-
642-3100

TRS-80 trademark of Radio Shack — CP/M Trademark of Digital Research

DISK DRIVES

FROM: **SIEMENS**
NEW PRICES ☐
EFFECTIVE NOW

HARD DISKS & FLOPPIES FOR YOUR HEATH, RADIO SHACK, OSI & S-100 SYSTEMS

**EXACT REPLACEMENT OR
 ADD-ON HEATH DISK DRIVES
 NOW AVAILABLE**

**WE HAVE ADD-ON 5 1/4" DISK DRIVES
 FOR THE IBM PERSONAL
 COMPUTER**

5 1/4 DISK DRIVES (MODEL FDD-100-5b) for Heath, RS MOD I, S-100, N. Star & more

SIEMENS 5 1/4" drives are single sided, single or double density drives that are designed for years of trouble free service. These are the floppy models which other companies charge 15 to 30 dollars more for. The 5 1/4" is the exact same one used in the HEATH systems, but check our price! NOW \$240.00

5 1/4" WITH CASE AND POWER

Our 5 1/4" drives are also available in system packages. One 5 1/4" floppy in case with power supply tested \$285.00
 2 drives in dual case \$585.00



80 TRACK - DOUBLE SIDED 5 1/4" for Heath, CDR, RS MOD III, S-100 & more

A new product from SIEMENS. This beauty is a new entry to the Floppy market. Get up to 800K Bytes storage on a 5 1/4" diskette. Model #FDD-221-5 NOW \$350.00 ea.

PACKAGE DEAL 80 TRACK 5 1/4"

1 dual sided 80 track drive (in case with power supply) \$395. Two 80 track double sided (in one enclosure) \$795.

8" FLOPPY DISK DRIVES (MODEL FDD-100-8d) for Heath, OSI, S-100, RS MOD II & more

SIEMENS 8" drives are single sided, single or double density with simple power requirements. +24 and +5 VDC. It has automatic diskette ejection and a fail safe interlock that prevents the door from closing on a partially inserted diskette. The track to track time is as fast as 4ms. These drives are completely compatible with your MOD II, OSI, and many other systems. NOW \$340.00 ea.

8" SYSTEM PACKAGES

One or two 8" SIEMENS drives with cabinet (choice of vertical or horizontal) power supply, all power connections, manuals and fan. A beautifully functional package built only of the best grade components. Available fully assembled and tested for \$100.00 more.

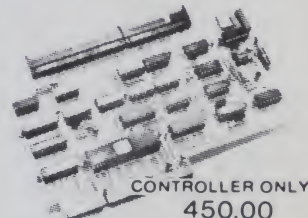
Single 8" drive in dual cabinet (data cables extra) \$650.00
 Dual drive package (data cables extra) \$980.00

ATTENTION HEATH H-88, 89 OWNERS

HEATH owners, we now have the CDR controller card that allows you to use our 8" drives on the H-88 or H-89 computers! You may mix any combination of 8" or 5 1/4" drives and also change your system to soft sector formatting! Mix any combo single sided, double sided, single density or double density. We even include the zero origin prom. As a special offer we are giving you ALL necessary components with this system, even the patch for C/PM!

A complete dual 8" system for the H-88 or H-89 \$1450.00.

Dual 5 1/4" 40 track system with controller \$1050. Dual 5 1/4" 80 track system with controller \$1250.



WINCHESTER TECHNOLOGY HARD DISK SYSTEMS

5 or 10 MEGABYTE Hard Disk systems for your HEATH H-88, 89, Radio Shack Mod I, II or III, Apple, IBM, or any S-100 system! You get a 5 or 10 megabyte formatted hard disk, power supply, cabinet, all interfacing cables, and CP/M boot loader. Most of all its all factory preassembled and tested, burned in and ready to run! You even get a real time clock (except HEATH). Built only of commercial grade components. JUST \$2400. 5mb and \$2700. 10mb



quantity discounts available some of the 8" packages require assembly...we carry parts for siemens



PAYMENT POLICY

We accept Mastercard, Visa, personal checks & MO. We reserve the right to wait 10 working days for personal checks to clear your bank before we ship. All shipping standard UPS rates plus insurance. NJ residents must add 5% sales tax.



FLOPPY DISK SERVICES, INC

C.N.5212

Circle 191 on Reader Service card.

PHONE INQUIRIES WELCOME 9AM to 5PM (ET)

PRINCETON, NEW JERSEY 08540

609-771-0374

PRICES & SPECIFICATIONS SUBJECT TO CHANGE

MOD II. CP/M are trademarks of Tandy and Digital Research respectively.

Software Protection— A Legal Overview

Legal protection for software does exist. But is it adequate?

By Jeffry Kamenetz

Anyone who has ever written a computer program knows that a lot of work is involved. Both the professional computer programmer and the kitchen-table artist expect to write or rewrite most of their software three or four times before the program is officially released.

The industry standard for generating machine-language code used in computer operating systems and games, where speed is a must, is ten lines a day. True, while a good programmer can probably write those ten lines in under five minutes, one must consider all of this person's time. That would include typing in, debugging, rewriting, debugging, product testing and more debugging. And if he is doing his job, there will be an endless river of documentation.

For example, imagine a typical program of 16K bytes. This would be equal to 16,384 bytes of code at about 2.5 bytes per line. This is about 6553 lines of code, which at ten lines per day would take 5243 hours. Assuming that overhead and the cost of labor are about \$30 an hour, this hypothetical software program represents \$157,284 of investment.

Question: what protection is afforded the developer of this program once the product is marketed? Despite the competition's ability to apply reverse engineering, some means of protecting this special form of intellectual property do exist.

Trade Secrets

A trade secret is some special knowledge that one's financial concern has, but is unknown to others in

the same industry. Infringement of a trade secret is a violation of state law. Perhaps the best example of a trade secret is the formula for Coca-Cola.

The classic introduction to trade secrets comes from Restatement of Torts (1939):

A trade secret may consist of any formula, pattern, device or compilation of information used in one's business, which gives him an opportunity to obtain an advantage over competitors who do not know or use it. It may be a formula for a chemical compound, a process of manufacturing, treating or preserving materials, a pattern for a machine or other device, or a list of customers. . . . A trade secret is a process or device for continuous use in operation of the business. Generally, it relates to the production of goods, as, for example, a machine or formula for an article. It may, however, relate to the sale of goods or to other operations in the business, such as a code for determining discounts, rebates or other concessions in a price list or catalogue, or a list of specialized customers, or a method of book-keeping or other office management.

The basis for trade secret laws is common law instead of statutory law. Trade secret protection is implicit in contract law and the law of unfair competition.

It is up to the possessor of the secret to maintain its confidentiality. If the owner inadvertently loses this secret, then the secret is forever part of the public domain.

When it comes to software, the preferred method of protection is the trade secret. Typically, the developer of the software will supply only an object file listing in the form of a magnetic tape, floppy disk or read-only-memory (ROM). While it is possible to reverse-engineer the process

and figure out how the program works, it is difficult at best.

This strategy is reinforced with some clever engineering practices to prevent reading of the object code. If the file is on a floppy disk, the disk may have a special self-destruct routine that activates during copying. Another technique is where the floppy disk program references a special software serial number hidden in the hardware of the host computer. Then, every time the program is run, the serial number is compared against the floppy disk number to make sure they match. This implies that the disk would be specific to one particular user's machine. When an illegal copy of the program is loaded onto another computer, the check fails and the program aborts.

ROMs, on the other hand, can be embedded in a potting compound. This makes it impossible to access the chips without damaging them. A variation on this theme includes throwing metal particles into the potting compound to keep other hardware from being X-rayed.

However, the businessman's answer lies in drawing up license agreements between the program developer and the user.

Everyone thinks software protection issues involve stealing intricate programs. Case in point is the Data Cash Systems, Inc., case where a

Address correspondence to Jeffry Kamenetz, 14 Sadler, Windsor Locks, CT 06096.

read-only-memory was allegedly copied outright. But there are other, no-so-common, problems, especially with trade secrets. If the developing firm protects the work as a trade secret, the firm must have its employees sign a nondisclosure statement. Either the employer or the employee ends up losing on this practice. Most employees are reluctant to sign because it tends to scare off future prospective employers. They thus risk not being hired.

(Note, however, that an employee's continued employment once hired cannot be contingent upon signing such a statement.) If the programmer is not hired, the company loses because it has lost a good worker and is forced to spend more money searching for another employee.

On the other hand, the hiring company must consider what nondisclosure statements the potential employee may have signed prior to making a job application. For example, consider the employment of a programmer who was involved in writing an operating system for his previous employer. If this techni-

The easiest way to obtain protection is by applying for a copyright.

cian were to write an operating system for his new employer, there is the possibility of inviting a trade secret infringement suit.

Also, consider what happens if a commercial concern buys or rents software. More likely than not, the source of the software will require the user to be licensed. That is, the user agrees not to copy or make publicly available the program. Very often, there are questionable clauses giving the licensor the right to revoke the licensee's use of the software. This is analogous to credit cards—a customer is given the right to use one but the card still belongs to the credit card company. This enables the credit card company to impound the card if it is stolen or if the user is delin-

quent in payments. With software, however, the improper acts include copying or selling the program.

The licensee can be held financially responsible if the program is stolen. The big fear, of course, is that an employee may steal a copy of the program and quit, leaving the employer liable. One solution is to have the employees sign nondisclosure statements, but that, as previously mentioned, has its drawbacks.

The use of such programs creates another problem, as Robert P. Bigelow points out in an *Infosystems* article (see References):

A program that costs \$500 a month may become so integrated with the company's operations that losing the right to use it could cost millions in lost productive time, poor customer relations and delayed financial statements.

In summary, trade secrets provide shaky protection at best.

Copyrights

By far, the easiest way to obtain protection for a program is by applying for a copyright. The cost is about \$10 and requires the programmer to fill out Form TX and send two copies of the publicized work to the United

Circle 356 on Reader Service card.

Get better looking with your IBM. Introducing the PC Pedestal™ from Curtis Manufacturing

Now you can get a real good look at your IBM Personal Computer

With Curtis Manufacturing's new PC Pedestal™ you can tilt or swivel the IBM display unit to suit yourself.

No more bobbing and weaving to avoid reflections. No more squinting to minimize glare.

The PC Pedestal™ virtually eliminates backache, eye strain, and fatigue. And that results in greater comfort and increased productivity all around.

Developed exclusively for the IBM Monochrome Display,

the PC Pedestal™ is a perfect match in style, color & finish.

Best of all, when you see how little it costs to gain these benefits, you're going to be looking better already.

Extension Cables, too.

For even greater flexibility in arranging your system components, a 3-foot extension cable set is also available for your IBM display unit.



Manufacturing Company

CURTIS

For credit card orders
call: 1-800-824-7888
in California
1-800-852-7777
in Alaska & Hawaii
1-800-824-7919

ASK FOR OPERATOR 157

	PRICE	QTY.	AMOUNT
PC PEDESTAL™	\$79.95		
EXTENSION CABLES	49.95		
postage per item	3.00		
MC-1		TOTAL	
NAME _____			
COMPANY _____			
ADDRESS _____			
CITY _____	STATE _____	ZIP _____	

MAIL TO:
Curtis Manufacturing Co.,
One Curtis Road, Winchester, NH 03470

☐ check ☐ money order ☐ Master Card ☐ VISA ☐ send additional information
account # _____ Master Card Interbank # _____
SIGNATURE _____ expiration date ____/____/____
month year

States Copyright Office.

A copyright usually runs 50 years past the life of an author. If you wrote the program for hire, then the life of protection is the lesser time of 75 years from publication or 100 years from when the program was written. The copyright guarantees the programmer exclusive legal rights to the copying of one's "expression." If, however, the competition rewrote a copyrighted program so that its function was the same, there would be no grounds for claiming copyright infringement. Rewriting programs requires little effort by software pirates. A software thief could even legally copyright his revised program. Thus, copyrights have limited value.

Currently, copyright laws cover object code programs. The 1976 copyright laws represented landmark legislation, in that source listings were covered on the grounds that they were simply text. However, the law made no attempt to relate electronic storage mediums such as ROM (read-only-memory) and floppy disk to copyright protection. Hence came the infamous case of *Data Cash Systems v. JS & A Group, Inc.* After Data Cash Systems began marketing a chess game for \$169, JS & A came out with a unit that bore an amazing likeness to Data Cash Systems'. Not only were the programs identical, but JS & A Group, Inc., had the audacity to sell the game for \$99. The final and standing decision was made by the U.S. Court of Appeals for the Seventh Circuit, which agreed with a lower court's finding that object-code programs are not copyrightable.

This void in the copyright law was filled in the final days of the 96th Congress when they passed the Computer Software Copyright Act of 1980. The law amends the 1976 copyright statute by defining a computer program as a set of statements or instructions to be used directly or indirectly in a computer to bring about a certain result. Says Christopher Kern in a *Byte* article, "The word 'directly' refers, of course, to the object code."

It should also be noted in the *Data Cash* case that even if ROM had been copyrightable at the time there is still another problem. Nowhere in the ROM was there anything that faintly resembled a copyright notice. Once something is published without the notice, all copyrights are irrevocably lost to the public domain. It was somewhat foolish for Data Cash to

The panacea for all
computer protection
most likely lies with
U.S. patent law.

bring the infringement suit in light of the missing copyright notice.

Copyright protection is rarely used seriously. Many amateur programmers like the idea of copyrighting their works. Many software houses place the notice in the beginning of their programs but never bother to file their copyright with the Library of Congress. These notices are intended to discourage others from copying the program. Many companies that do follow the whole copyright process understand that the work may still be misappropriated. The Library of Congress is also losing its composure with respect to copyrights. There are thoughts of extending copyright protection to any published work that bears the notice. This would mean the Library would no longer require a copy of the work.

Before leaving copyrights, note the interesting parallel between records and computer programs. When phonographic records first were produced, there was no copyright protection. Almost immediately a whole industry developed in pirating records. The copying of records became financially disastrous to the legitimate record producers. Congress realized the problem and extended the copyright laws to cover records. Like records, computer program protection evolved within the copyright laws to prevent the onslaught of chaos in the industry.

Patents

The panacea for all computer protection most likely lies within the U.S. patent law system. This is because, as writer Robert J. Frank says, "Patent law is intended to give protection to apparatus and methods which are embodiments of an idea." That is, the underlying concepts of an invention are also protected. Thus, unlike copyrighted programs, patented programs cannot be modified, transposed or translated.

Unfortunately, while the computer

programming industry may be ready for patents, patents are not ready for the computing industry. Government officials appear to have a lot of inertia with respect to accepting computer programs. The foremost culprit seems to be the U.S. Patent and Trademark Office (PTO).

Ideally, the PTO should be very close to the cutting edge of technology. They are the referees in this game. So far, the PTO has been mule-like in refusing to patent anything that smells the least like a computer program. Then there is the Supreme Court, which would probably rather not get involved. However, when they agree to hear such cases, they have adhered to one simple guideline—promote the useful arts.

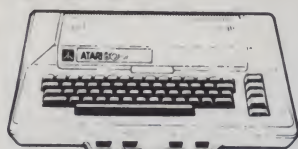
To many observers, including the Court of Customs and Patent Appeals (CCPA), their decisions are hard to interpret. Three cases tend to stick out from the crowd: *Benson*, *Flook* and *Diehr*.

The case of *Gottschalk v. Benson* (409 US, 1972) could be considered a primitive version of today's typical software patent case. On Oct. 9, 1963, Arthur C. Tabbot and Gary R. Benson filed a patent application "for Conversion of Numerical Information." Their employer, Bell Telephone Labs, Inc., intended to use the invention in the infamous PBX (private brand exchange) system that Bell was marketing. Specifically, the invention was an algorithm which converted binary-coded-decimal data to pure binary numbers. Both the examiner for the patent application and the PTO Board of Appeals rejected the claims of Benson and Tabbot that the algorithm was patentable.

Then the CCPA reversed the Patent and Trademarks Office. The Commissioner of Patents, Gottschalk, appealed the decision to the Supreme Court. The Supreme Court sided with the Commissioner:

It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula for converting BCD numerals to pure binary numerals were patented in this case. The mathematical formula involved here has no substantial practical application except in connection with a digital computer, which means that if the judgement below is affirmed, the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself.

The interpretation of this decision varies tremendously with that of the observer. Many experts speculate that the Court was purposely vague



ATARI 800
16K ... \$679
32K ... \$749
48K ... \$819

410 Recorder	\$76.00
810 Disc Drive	\$449.00
822 Printer	\$269.00
825 Printer	\$629.00
830 Modem	\$159.00
820 Printer	\$269.00
850 Interface	\$169.00
New DOS 2 System	\$29.00
CX30 Paddle	\$18.00
CX40 Joy Stick	\$18.00
CX853 16K RAM	\$89.00
Microtek 16K RAM	\$69.00
Microtek 32K RAM	\$139.00
Ramdisk (128K)	\$449.00
One year extended warranty	\$70.00
INTEC 48K Ram	\$249.00
481 Entertainer	\$83.00
482 Educator	\$130.00
483 Programmer	\$57.00
484 Communicator	\$344.00



ATARI 400
16K ... \$299
32K ... \$478
48K ... \$555

Visicalc	\$179.00
Letterperfect	\$109.00
Ricochet	\$14.50
Crush Crumble & Chomp	\$24.00
Star Warrior	\$29.00
Rescue at Rigel	\$24.00
Datstones	\$18.00
Invasion Orion	\$18.50
Mission Asteroid	\$22.00
MouskATTACK	\$31.00
The Next Step	\$34.00
Softporn	\$27.00
Wizard & Princess	\$29.00
K-BYTE Krazy Shoot Out (ROM)	\$39.00
Protector (Disk 32K)	\$24.00
Jaw Breaker (on line disk)	\$27.00
Ghost Hunter (cassette)	\$24.00
Ghost Hunter (disk)	\$30.00
PAC MAN	\$35.00
Centipede	\$35.00
Caverns of Mars	\$32.00
Synapse	
File Manager 800	\$69.95
Dodge Racer	\$19.00
Chicken	\$24.00
Slime	\$24.00
Nautilus	\$24.00
Disk Manager	\$24.00
Fort Apocalypse	\$24.00
Assembler	\$39.00



Texas Instruments



TI-99/4A \$299

R.F. Modulator	\$29.00
Telephone Coupler	\$169.00
RS-232 Accessories Interface	\$169.00
Disk Drive Controller	\$239.00
Disk Memory Drive	\$389.00
Memory Expansion (32K RAM)	\$319.00
Wired Remote Controllers(Pair)	\$31.00
32K Expansion	\$329.00
PHP Printer Solid State	\$319.00
Home Financial Decisions	\$26.00
Personal Record Keeping	\$43.00
Mailing List	\$60.00
Checkbook Manager	\$18.00
Tombstone City 21st Century	\$34.00
Munch Man	\$34.00
TI Invaders	\$34.00
Car Wars	\$34.00

Computer Covers

ATTRACTIVE COVERS FOR YOU
COMPUTER AND DISK DRIVE.

Atari 400	\$6.99
Atari 800	\$6.99
Atari 810	\$6.99

All Atari Covers are Beige.

Commodore VIC-20	\$6.99
Commodore 8032	\$14.99
Commodore 8050/4040	\$10.99

All Commodore Covers are Royal Blue.

Monitors

Amdex 12" B&W	\$129.00
12" Green	\$139.00
13" Color	\$349.00
NEC	
12" B&W	\$169.00
12" Color	\$339.00
TI 10" Color	\$349.00
Zenith ZVM 121 (Green)	\$119.00

Televideo

910	\$579.00
912C	\$699.00
920C	\$749.00
925C	\$749.00
950	\$939.00

Modems

Livermore Star	\$119.00
Hayes	
Smart	\$239.00
Chronograph	\$199.00
Micromodem II	\$279.00
Micromodem 100	\$309.00
Novation Auto	\$239.00
D Cat	\$169.00
Cat	\$159.00



**HEWLETT
PACKARD**



HP-85 \$1899

80 Column Printer	\$799.00
HP-125	\$1999.00
HP-83	\$1699.00
HP-85 16K Memory Module	\$169.00
5 1/4" Dual Master Disc Drive	\$1769.00
HP-87	\$1769.00
Hard Disk w/Floppy	\$4349.00
Hard Disk	\$3440.00
"Sweet Lips" Plotter	\$1149.00

**HP41CV Calculator
\$239**

41C	\$189.00
11C	\$104.00
12C	\$114.00
34C	\$114.00
38C	\$114.00
HP-41 Printer	\$340.00
HPIL CALCULATOR PERIPHERALS	
IL Modul	\$104.00
Digital Cassette	\$449.00
Printer/Plotter	\$419.00
Card Reader	\$164.00
Optical Wand	\$99.00

Apple

Call for availability and prices
on all Apple computers and peripherals.

Printers

Centronics 739-1	\$519.00
Centronics 739-3	\$619.00
Diablo 630 Special	\$1799.00
Epson	
MX80 w/Graftrax	\$449.00
MX80FT	Call
MX100	Call
NEC	
8023	\$549.00
7730	Call
7720	Call
7710	Call
Okidata	
82A	\$499.00
83A	\$749.00
84	\$1129.00
Citoh Starwriter	
F10-40 CPS	\$1469.00
F10-55 CPS	Call
Prowriter	\$479.00
Talley	
8024-7	\$1399.00
8024-L	\$1629.00
IDS	
Paper Tiger	\$Call
Prism	\$Call
2 Meter RS232-RS232	\$29.95

Cables Available For Most
Interfacing Purposes

commodore

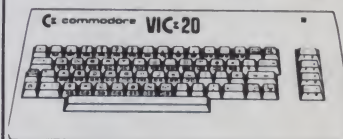


8032 \$1039

4032	\$969.00
4016	\$769.00
8096 Upgrade Kit	\$399.00
Super Pet	\$1599.00
2031	\$529.00
8250 (Double Sided D. Drive)	\$1699.00
5 Megabyte Hard Disk	\$2399.00
8050	\$1299.00
4040	\$969.00
8300 (Letter Quality)	\$1799.00
8023	\$769.00
4022	\$599.00
Pet to IEEE Cable	\$37.00
IEEE to IEEE Cable	\$46.00
Tractor Feed for 8300	\$240.00

SOFTWARE

Commodore	Magis
BPI	Professional Software
Visicorp	Creative Software



**VIC 20
\$249**

Call for price and availability of
VIC-64

16K VIC Expansion	\$99.00
Commodore Catassette	\$69.00
Disk Drive	\$499.00
VIC Graphic Printer	\$339.00
3K Memory Expander	\$32.00
8K Memory Expander	\$53.00
RS232C Terminal Interface	\$43.00
VIC IEEE-488 Interface	\$86.00
VIC 20 Super Expander	\$53.00
Programmers Reference Guide	\$15.00
Introduction to Computing	\$19.00
Introduction to BASIC Programming	\$19.00
Household Finance	\$27.00
VIC Games	\$19.00
VIC Home Inventory	\$13.00
VIC Rec/Ed II	\$13.00
Terminal	\$13.00
Un Word	\$13.00
Grafix Managerie	\$11.00
VIC PICS	\$15.00
Ticker Tape	\$13.00
Banner Headliner	\$13.00
RS 232	\$39.00
Super Slot	\$23.00
VIC Avengers	\$23.00
Super Alien	\$23.00
Super Lander	\$23.00
Draw Poker	\$23.00
Midnite Drive	\$23.00

computer mail order

east
800-233-8950

**CALL TOLL FREE
HOW TO ORDER:**

west
800-648-3311

477 East Third Street
Williamsport, PA 17701
(717) 327-9575
Patricio Habla Espanol

In-stock items shipped same day you call. No risk, no deposit on C.O.D. orders. Pre-paid orders receive free shipping within the continental United States with no waiting period for certified checks or money orders. All prices shown are cash prices add 3% for Mastercard and Visa. NV and PA residents add sales tax. All items subject to availability and price change.

P.O. Box 6689
Stateline, Nevada 89449
(702) 588-5654
Franco Habla Espanol

in certain statements because the justices were ignorant of computer technology. This is understandable in light of computers being relatively new and the fact that this case was the first of its kind.

Unfortunately, the general lasting impression was that all computer programs, being algorithms, were not patentable. Algorithms themselves are not patentable because they are not useful.

The second noteworthy case is *Parker, Commissioner of Patents v. Flook* (437 U.S. 584, 1978). Flook developed a system whereby alarm limits were calculated by a computer program. The alarm limit signaled that an inefficient or dangerous condition existed during the chemical processing of hydrocarbons. The inventor openly admitted the importance of the computer program. However, he claimed the invention was patentable since the algorithm was tied to a specific process.

The Supreme Court rejected Flook's claims by 6 to 3. Justice Paul Stevens, who wrote the opinion for the Court, said the processes were already known. However, there was a condition to this statement:

(The) respondent's process is unpatentable, not because it contains a mathematical algorithm, but because once that algorithm is assumed to be within prior art, the application, considered as a whole, contains no patentable invention.

The Court's reasoning is considered faulty by many experts in the field. Although some things are known about the catalytic hydrocarbon conversion process, Dale R. Flook's process was novel. Justice Stewart, who dissented in *Flook*, made an elegant statement to the effect that natural processes are not patentable subject matter. The Justice's statement is true, but does not apply since the process does not exist naturally. Rather, Dale R. Flook invented the process, which presumably had never occurred before.

Of what value, then, is the Flook decision? First, it shot down a small rally by the pro-software-patenting forces. Several previous victories had given them momentum. By the same token, it reinforced past anti-software-patenting victories, including *Benson*.

Just as important, the Court did not jump on the opportunity to rule that the subject matter was not patentable. It was as if the Court was thinking that *maybe* computer programs do

constitute patentable material. The incorrect arguments made about the case by the Court further enhanced this possibility.

The third major decision in protection of software is the case of *Diamond, Commissioner of Patents v. Diehr*. The inventor developed a system for curing rubber under computer control. This controller monitored the temperature inside the furnace and stopped the process when the rubber had cured. The Supreme Court ruled by a narrow margin of 5 to 4 that the Diehr invention was patentable.

Diehr bears a strong resemblance to *Flook*. The difference in the eyes of the Court was in the novelty claims. In *Flook*, the novelty was in the algorithm, not in the calculation of alarm limits. An algorithm does not constitute statutory subject matter. In *Diehr*, the whole system was considered novel, which is the basis for all patents. That is, monitoring the temperature in real time and then automatically shutting off the furnace was genuinely novel.

The acceptance of a patent application including a computer program is the significant part of this case. Justice William Rhenquist, speaking for the Court, said, "A claim drawn to subject matter otherwise statutory does not become nonstatutory simply because it uses a mathematical formula, computer program or digital computer."

These three cases, as well as many others, are important because they are the precedents for future software-patent cases. The concept of a precedent is referred to as "stare decisis." It is unfortunate that the Supreme Court could not rehear the cases of *Benson* and *Flook*. If they could, they would have the opportunity to clarify their arguments, even if the decisions were to remain the same. The *Benson* and *Flook* decisions and arguments tend to push the Court into anti-software-patent decisions. Currently, any future decisions reflecting enlightened thinking could cause confusion due to inconsistencies with earlier decisions. However, some may argue that this has already happened in the two similar cases of *Flook* and *Diehr*.

It seems as if the biggest hurdle that one has to overcome when patenting software is the requirement of statutory subject matter. The philosophy behind the patent system is

that the application of ideas, but not ideas alone, should be patented. Ideas without an application do not fit the patent system definition of being "useful." Remember that ideas are related to algorithms, which in turn are related to computer programs. In *Benson*, *Flook* and *Diehr*, the inventors were cautiously avoiding making a claim on the computer program *per se*. Thus, since protection of software is in its infancy, attempting to patent a software program is out of the question.

There are two means of claiming patentable subject matter for software-based inventions. First, one could claim that the program is a process, which is one of the four classes of patentable inventions. A process—a way of doing things—could apply to software. Nevertheless, the program must be tied to some concrete application. Also, the software-based invention must meet the same requirements as another invention—it must be novel, useful and nonobvious.

Another criterion for software-based process patents is known as the "mental step doctrine" or the "paper and pencil test." You can't patent a process consisting entirely of mental steps, since such a process is a law of nature or a disembodied idea.

Alternatively, one could claim that the invention was an extension of a machine. An excellent example of this is the first claimed software patent. Martin A. Goetz of Applied Data Research applied for a patent where the software was hardwired electronics. The Patent and Trademarks Office arbitrarily decided that his invention was not software. It would, therefore, not be an algorithm and the invention would still be patentable on this account.

One could argue that, therefore, ROM and floppy disks would be patentable. Unfortunately, this view has not been widely accepted. This case underscores the importance of the software definition debate. Unlike the wording used in previous decisions by the judicial system, software must be rigorously defined. It seems foolish to spend large amounts of time and money on such an endeavor, but it is necessary.

The last major stumbling block for a software invention is the nonobviousness requirement. This criterion is unusual in that it is relative to the inventor. According to 35 USC Section 103:

ARE YOU OUT OF CONTROL?

OUR 6502 BASED MICROCOMPUTER HAS EVERYTHING UNDER CONTROL.

THE COMPUTER "SLIM"

- 6502 MICROPROCESSOR
- 2K BYTES RAM
- 2K OR 4K EPROM
- FOUR 8 BIT I/O PORTS
- POWER ON RESET
- CRYSTAL CLOCK
- BUFFERED SYM-AIM BUS

PRICE 81-260A **\$199.95** ASSM.
81-260K **\$149.95** KIT
81-260B **\$ 39.95** BARE BOARD

THE PERIPHERALS

RAM EPROM MEMORY

- 32K BYTES OF RAM OR EPROM
- PRICE 81-330A **\$ 99.95** ASSM. W/O MEMORY
81-330B **\$ 49.95** BARE BOARD

6 SLOT MOTHER BOARD

- .750" BOARD SPACING 44 PIN BUS
- PRICE 81-320A **\$ 99.95** ASSEMBLED
81-320B **\$ 49.95** BARE BOARD

24 HOUR REAL TIME CLOCK

- FOUR DIGIT LED DISPLAY
 - ON BOARD POWER SUPPLY
- PRICE 81-350A **\$149.95** ASSEMBLED
81-350B **\$ 49.95** BARE BOARD

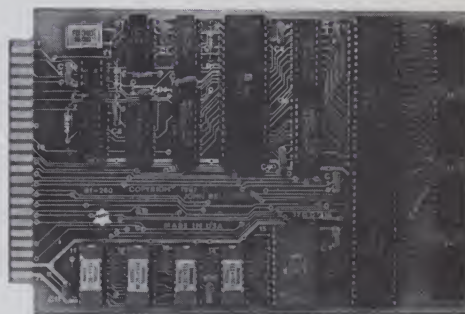
ANALOG I/O INTERFACE

- 16 ANALOG INPUT CHANNELS
 - 2 ANALOG OUTPUT CHANNELS
- PRICE 81-292A **\$199.95** ASSEMBLED
81-292B **\$ 49.95** BARE BOARD

12 PORT PARALLEL I/O BOARD

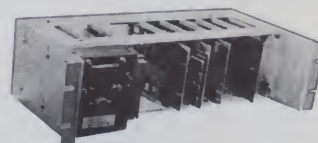
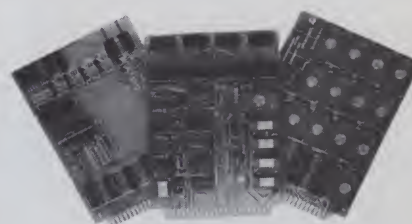
- 12 8 BIT I/O PORTS — 6 6522S
- PRICE 82-036A **\$169.95** ASSEMBLED
82-036B **\$ 49.95** BARE BOARD

MONITOR + TINY BASIC 2532 **\$39.95**



THE COMPUTER "SLIM"

ALL BOARDS ARE 4.5 X 6.5 WITH GOLD EDGE CONNECTORS SOLDER MASK BOTH SIDES



19" RACK MOUNTING

CALL 415 592-8411 FOR MORE INFORMATION.

OUR SALES PEOPLE WILL BE GLAD TO DEMONSTRATE OUR PRODUCTS AT YOUR COMPANY. OEM PRICING AVAILABLE.



JOHN BELL ENGINEERING, INC.

MC

ALL PRODUCTS ARE AVAILABLE FROM JOHN BELL ENGINEERING, INC. • 1014 CENTER ST., SAN CARLOS, CA 94070
ADD SALES TAX IN CALIFORNIA • ADD 5% SHIPPING & HANDLING 3% FOR ORDERS OVER \$100
SEND FOR CATALOG

(415) 592-8411

WILL CALL HOURS: 9am - 4pm

10% OUTSIDE U.S.A.

VISA

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title (Title 35), if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention was made to a person having ordinary skill in the art to which said subject matter pertains. . . .

In summary, a pure computer program patent application has no chance of being accepted unless Congress changes the law. The only use of the patent-pending notice on a program listing is to deter misappropriations of one's work. On the other hand, inventions in which a computer program is used in a machine or process claim patent (*Diehr*, for example) are patentable when new, useful and nonobvious.

A Proposal for New Legal Protection of Software

The laws concerning legal protection of computer software are still evolving. In the last few years, the focus has been mainly on decisions coming from the court system. Many, however, feel that Congress must leg-

islate the proper protection. After all, what can you say about a system that allows copyrighting of phone books and the patenting of over 100 different features of vibrators as sex aids but will not provide full protection to computer programs?

The best way would be to modify the current patent law system to include special patents for software. These might be mini-patents having a life of, say, seven years. This way, adequate protection would be afforded the inventing company, but not so much protection that the rest of the high technology industry would be choked off. Ultimately, a larger number of computer program patents would be rejected over time as prior art and obviousness came into play.

The flood gates would open if such a move was made. Currently, the patent office has a backlog of some 3000 software-related patent applications in spite of PTO's well-known position regarding patents. Imagine how many applications would be filed if software was declared to be patentable.

Could the Patents and Trademarks Office (PTO) process software-based

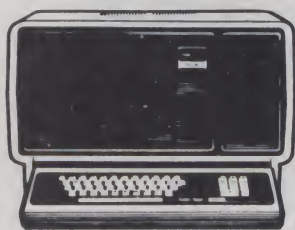
patent applications? Skeptics argue that the PTO would not be able to adequately search for prior art. This is a moot point, since if there really is prior art despite the issue of a patent, then the patentability of a program, or invention, could still be contested by a competitor. The system could still work whether policed by the government or zealous, possibly self-serving, members of the private sector.

Besides wearing egg on its face, the PTO must confront another problem from revoking a patent. What happens to the money made by the company to which the patent was given? By the same token, what compensation is given to the competition from having the government grant one firm a monopoly? I would propose the following scheme.

First, all programs be assigned a fixed market worth based on the value of comparable programs and the judgement of the patent examiner. Second, have the software vendor place any amount received in excess of this fixed worth in an escrow account bearing interest. This extra amount of money is compensation

✓ CHECK US FIRST! for DISCOUNT TRS-80[®] COMPUTERS

BUY DIRECT



- ✓ No Out-of-State - Taxes - Kansans Add 4%
- ✓ Large Inventory for Immediate Shipment
- ✓ 100% TRS-80[®] Equipment
- ✓ Convenient Order Number
- ✓ F-48 Form Provided

**TRS-80
CALL US FOR
OUR PRICES
and PRICE List**

**Kansas Residents:
316-624-1919 (Collect)**

1-800-835-9056

- ✓ Visa, Mastercard
- ✓ Wire Transfers
- ✓ Bank Cashier's
Checks & Money
Orders.

Jimscot, Inc.

**1023 N. Kansas
P.O. Box 607
Liberal, Ks. 67901**

Circle 164 on Reader Service card.

TRS-80 is a registered Trademark of Tandy Corp.

for the novelty, and thus patentability, of the program. If the patent survives throughout the duration of the patent term, then the company may pocket the escrow account. If the patent is invalidated during its lifetime, the amount in escrow, plus interest, is returned to the users.

This proposal rewards the software inventor what he is due and negates the patent advantage when he has tried to protect an unpatentable program. The users of the software and the competition can protect themselves, since any of them can initiate the invalidation procedure. The invalidation procedure is simple, requiring only that the Commissioner of Patents be informed of the reason(s) why the patent should be held invalid. The Commissioner's duty is then to void the patent.

The old school of thought that programs are algorithms and thus should not be patented is erroneous. These critics point to the 200-year philosophy inherent in the Constitution stating that algorithms by themselves are not useful, but that the application of them could be. Two hundred years ago, an algorithm was some relatively simple set of equations that tended to be theoretical or purely scientific in nature. Hence an algorithm was not considered useful. Computer programs today are useful when they save time and money computing financial records, retrieving and storing information and simulating physical processes.

And what of the added cost incurred to the Patent Office as a result of processing software patents? One must contemplate the cost of not having patentability for software. If there continues to be a lack of protection for software, software development houses will lose their incentive to invent software. The whole industry could fold up. This is especially grim in light of foreign competition in other markets.

Also, software is essential to the well-being of any hardware manufacturer. A case in point is the Texas Instruments TI 99/4 home computer, which was a dismal financial failure because of little software support. Unquestionably, the cost of implementing a patent system or similar strong protection for software is much less than the cost of not having such a system.

Currently, the American Patent Law Association has a subcommittee working on the protection of soft-

ware. Internationally, the World Intellectual Property Organization is working on the same idea. Even Congress is rumored to be investigating

the possibilities. It is expected that the whole process will be iterative. First, a group will propose a change and then the critics will come in and

Programmers Fight Back

Some interesting events have occurred recently in the area of legal protection for software. Trade secret methods are becoming more sophisticated. For example, a new Basic compiler that came on the market recently has an option for using serial numbers to access already compiled programs. If a user/customer wants to run the program, he must provide the correct serial number, or the disk on which the program resides will self-destruct.

Also, some software houses are getting tricky with their license agreements. After a customer signs such an agreement, he is given a personalized copy of the program. Whenever the program is run, the licensee's name is displayed along with the copyright statement. For example:

Copyright 1982 by John Smith

Note: The program is licensed only to Joe User by John Smith.

If the licensee gives the program away to a friend, the bootlegged copy will reveal the identity of the original software pirate. Thus, software users will have a good incentive for not breaking their license agreements.

Copyright controversy has been on the rise. Atari has been shaking up the industry with tough talk against alleged copyright infringers. On a related issue, Al Tommervik reports on the precedent of the obscure "ten foot rule." A Nebraska judge held that if a "reasonable person could not at ten feet, tell the difference between two competitive products, then there was cause to believe that an infringement was occurring."

Roy N. Freed of *Software News* detailed a move by the Copyright Office to prefer source code registrations as opposed to object code. This would detract from the bene-

fits of copyright protection because of the higher level of disclosure required by the author. Note that source code such as "A = B*EXP(-DT/TAU)" is more explicit than an object code of "FE 56 DE 2C 3A . . ."

Freed also reminds us to place the copyright notice not only at the beginning of the program, but on the storage medium itself. For a disk, one would write the copyright on the hub. Also note that one's copyrights (one's right to copy) can precede the actual copyright registration. This means, you can send your program to software houses without the fear, at least in theory, of being the victim of a software pirate. It is illegal for them to distribute your work without a formal written agreement signed by you. However, the author must be prepared to go to court if necessary to implement this right. Sadly, this is sometimes not practical or possible in terms of documentation (of the infringement), time and money involved.

Finally, S. Pal Asyn claims to be the first patentee (#4,270,182) of a software program. This computer analyst developed a high powered information retrieval system. If his claims are correct, he has broken new ground in the field of software protection. As for Asyn, he is busy selling, you guessed it, a book on how to patent software.

References

- Freed, Roy N., "Law Discriminates Against Micro Software." *Software News*, January 4, 1982, pp. 13, 14.
- Freed, Roy N., "Brouhaha Manifests Copyright Ignorance." *Software News*, February 2, 1982, pp. 19 and 24.
- Needle, David, "First Patentee Writes 'How to Patent Programs'." *InfoWorld*, February 22, 1982, pp. 1 and 5.
- Tommervik, Al, "The Great Arcade/Computer Controversy." *Softline*, January 1982, pp. 18-22.

send the authors of the proposal back to the drawing boards. We must all wait and see what develops.

Conclusions

Patents unquestionably hold the greatest protection for software because the idea itself is protected. There are, however, three current problems with patents. First, they are very expensive to draw up and obtain. An inventor should expect to pay over \$30,000 to successfully process a patent. This includes the inventor's time, lawyer fees and a prior art search. In addition, once the patent is issued, it is up to the inventor to enforce his patent. This requires initiating a very long and expensive infringement suit. The amortization of these costs tends to make patents unprofitable.

Second, patents are currently only being granted for software when it is part of the system. They are not being given out for software alone. As in *Diamond v. Diehr*, the software must not appear as one of the claims. Rather, the integration of a computer and its software and some process may constitute a novel, nonobvious and useful idea that is worthy of a patent.

Third, if it was possible and advantageous to apply for a patent solely on a computer program, would one accept it? Many big corporations would say no. In light of the IBM case, patents are becoming associated with antitrust suits. Indeed, a patent may grant you exclusive rights to an idea, but it does not guarantee the right to make, use or sell the embodiment of that idea. In the IBM case, the government has been alleging in court that for some 11 years, IBM has used its 50,000-plus patents and other advantages to cut competitors out of the marketplace.

The cost of losing an antitrust case is expensive. The Justice Department may rule that a large corporation such as IBM must divest into smaller companies. Or the firm may be required to extract itself from a market and let others step in and be given a fair chance. In a previous case, IBM was forced to stop renting keypunch machines and start selling them. Also, IBM was ordered to share specialized knowledge with its competition. The perseverance of the Justice Department in applying the Sherman Act of 1891 is a genuine threat to the patent system as a whole.

Copyrights, on the other hand, pro-

tect the right to publish the document in question. If the work, as the law is currently interpreted, is rewritten, then the desired protection has been circumvented. This is easily done because the work, by virtue of the copyright, is a document made public.

The trade secret is the weakest type of protection from a legal standpoint. For successful implementation of an infringement suit, one must prove that the information was obtained by unscrupulous means. The necessary proof is difficult to come by.

The best solution is
to modify the
current patent laws.

I have some specific recommendations for firms contemplating protection for their software. For most programs, the trade secret is the best route to go. Unlike the copyright, the critical information comprising the worth of the program is not a matter of public record. It is simple and works fairly well. In protecting the trade secret, one is advised to employ every method and trick to thwart competition applying reverse engineering. For ROMs, this may include nonsense instructions and erroneous data coupled with false starting points.

There are very few examples where it may be advised to apply for a copyright. If, for example, one had a unique set of data used by a conventional algorithm, then it would be worth copyrighting. An example might be a computer version of the game Boggle. This is a word game where a player tries to form as many words as possible using strings of adjacent letters. In the original board game, the letters were faces of 16 cubes spilled into a tray. The computer version enhances the play of the game by forming the game board automatically and performing timing functions. Copyrighting the computer version (erroneously assuming that the game board version was not already copyrighted) would make sense. While writing the algorithm is trivial, coming up with the data is hard. It seems that nothing (but the original data base representing each of the 16 cubes) has the degree of excitement that the initial version had.

That is, the data is critical to the success of the game. In this case it would be wise to protect the data by copyrighting the computer program.

The ability to adequately protect software is and will be in limbo for two reasons. First, the judges in the court system that help shape the law are ignorant in the areas of patent law, let alone engineering. In the New York Court District, one judge with a patent law background was removed, in effect, from hearing patent law cases. This occurred because of his competence in judging a few initial cases. In these cases, he overturned some faulty decisions by previous judges. His actions were particularly embarrassing to the other judges and it was decided that he should be kept from hearing patent law cases altogether.

Second, it would be very difficult to draft a patent law amendment for computer programs which is not either overly or underly protective. The benefits of protecting and providing incentives to one inventor must be traded off against the potential stifling of the competition. Ultimately, any worthwhile invention performs a service to the public. However, the question arises—would the issuing patent discourage or prevent other useful inventions from coming to market? The answers are far from being simple.

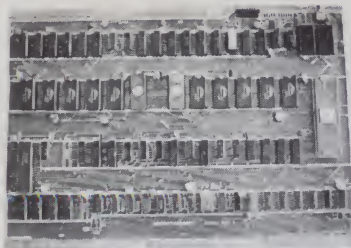
The software protection issue could take one of two possible directions. First, some think copyrights may evolve through future court cases to encompass a larger protection than first thought. This would imply that parts of a program or the underlying idea (the embodiment) of a program may be protected. This seems doubtful since the intent of the copyright law protects only the right to publish one's expression. Second, a minipatent or a derivative could be legislated by Congress. There seems to be some support in government for this idea.

On the other hand, many believe that protecting software is a big can of legal worms. They believe that algorithms and computer programs should be shared with the rest of society in general. What protection is needed is provided by trade secrets and copyrights.

As for the future, the form of protection that will be in vogue is anybody's guess. It all depends on programmers, engineers, judges and Congress. Any bets? ■

(continued)

NEW! M-68000 SINGLE BOARD COMPUTER



Circle 254 on Reader Service card.

FEATURES:

16 bit Motorola 68000 CPU operating & 10MHz, 20K bytes of on board fast static RAM, 16K bytes of on board EPROM space, 7 levels of prioritized vectored interrupts, 2 memory expansion buses (up to 256K), 2 serial communication ports (RS-232C), 16-bit bidirectional parallel port, 6800 peripheral accommodation bus, 5x16-bit counter / timers with vectored interrupts, on board real time clock, software compatible with Motorola MEX-68KDM board.

PRICE:

Bare board with documentation \$99.95
MEX68KDM compatible monitor in
2764 EPROM's \$120.00
M68000 CPU & memory map PROM \$115.00
Shipping and handling (Domestic) \$3.00
(Foreign) \$15.00
714/553-0133 CALIFORNIA RESIDENTS ADD 6% TAX

EMS Educational
Microcomputer
Systems
P.O. BOX 16115 IRVINE, CA. 92713-6115

Circle 83 on Reader Service card.

MICRO-PROFESSOR
APP-1 USER'S AND
EXPERIMENT
MANUAL

Dear Electronic Enthusiast
Now Let the
Micro-Professor™ usher you
into the microcomputer
revolution.
The Micro-Professor™ is the
first, really low-cost learning
system designed for personal
use. It will truly become your
"Personal Computer".
Sincerely,
Chris Johnson, Customer Service
only **\$149.95**

Z-80 BASED

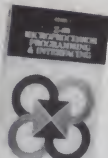
MICROCOMPUTER

A superb learning tool for students, instructors, hobbyists.

Nothing else needed. Just plug in and start learning! Complete experimenters manual, easy instructions. 18 experiments., Fully expandable for Z80-CTC, Z80-PIO, EPROM, Breadboarding and prototyping. Invest with confidence. Now only \$149.95, two for only \$279.95. 2KB BASIC interpreter now available, only \$19.00. Full money back guarantee!

Plus-FREE GIFT

Check this box for FREE
Z-80 Microprocessor
Programming and
Interfacing textbook when
you order within 7 days.
\$12.95 value.



ETRONIX

For immediate action call TOLL FREE:

1-800-426-1044

NAME _____
ADDRESS _____
CITY _____ ST _____ ZIP _____
☐ VISA ☐ MSTRCD ☐ EXP. _____
ACCT. NO. _____

Circle 250 on Reader Service card.

FREE
with software purchase—
One CPM Handbook

Ad#27

ULTIMATE SOFTWARE PLAN

We'll match any advertised price on any item that we carry. And if you find a lower price on what you bought within 30 days of buying it, just show us the ad and we'll refund the difference. It's that simple.

DISCOUNT SOFTWARE

ULTIMATE SOFTWARE PLAN

Combine our price protection with the availability of full professional support and our automatic update service and you have the Ultimate Software Plan. It's a convenient, uncomplicated, logical way to get your software.

✓ (New items or new prices)

CP/M users: specify disk systems and formats. Most formats available.

CP/M 3

DISK WITH MANUAL ONLY

ARTIFICIAL INTELLIGENCE*
Medical(PAS-3) \$849/\$40
Dental (PAS-3) \$849/\$40

ASYST DESIGN*/FRONTIER

Prof Time Accounting \$549/\$40
General Subroutine \$269/\$40
Application Utilities \$439/\$40

COMPUTER PATHWAYS*

Pearl (level 1) \$ 99/\$25
Pearl (level 2) \$299/\$40
Pearl (level 3) \$549/\$50

DIGITAL RESEARCH*

CP/M 2.2
NorthStar \$149/\$25
TRS-80 Model II (P+T) \$159/\$35
Micropolis \$169/\$25
PL/I-80 \$459/\$35
BT-80 \$179/\$30
Mac \$ 85/\$15
Sid \$ 65/\$15
Z-Sid \$ 90/\$15
Tex \$ 90/\$15
DeSpool \$ 50/\$10
CB-80 \$459/\$35
CBasic-2 \$ 98/\$20

FOX & GELLER

Quickscreen \$135/\$na
Quicksort \$265/\$na
dutil \$ 65/\$na

GRAHAM-DORIAN*

General Ledger \$729/\$40
Acct Receivable \$729/\$40
Acct Payable \$729/\$40
Job Costing \$729/\$40
Payroll I \$729/\$40
Payroll II \$729/\$40
Payroll \$493/\$40
Inventory \$493/\$40
Cash Register \$493/\$40
Apartment Mgt. \$493/\$40

MICRO-AP*

S-Basic \$269/\$25
Selector IV \$295/\$35
Selector V \$495/\$50

MICRO DATA BASE SYSTEMS*

HDBS \$269/\$35
MDBS \$795/\$40
DRS or QRS or RTL \$269/\$10
MDBS PKG \$1295/\$60

MICROPRO*

WordStar \$319/\$60
Customization Notes \$429/\$na
Mail-Merge \$109/\$25
WordStar/Mail-Merge \$419/\$85
DataStar \$249/\$60
WordMaster \$119/\$40
SuperSort I \$199/\$40
Spell Star \$175/\$40
CalcStar \$259/\$na

MICROSOFT*

Basic-80 \$298
Basic Compiler \$329
Fortran-80 \$349
Cobol-80 \$629
M-Sort \$175
Macro-80 \$144
Edit-80 \$ 84
MuSimp/MuMath \$224
MuLisp-80 \$174
Multi Plan Call
Manager Series Call

ORGANIC SOFTWARE*

TextWriter III \$111/\$25
DateBook II \$269/\$25
Milestone \$269/\$30

OSBORNE*

General Ledger \$ 59/\$20
Acct Rec/Acct Pay \$ 59/\$20

Payroll w/Cost \$ 59/\$20
All 3 \$129/\$60
All 3 + CBASIC-2 \$199/\$75
Enhanced Osborne \$269/\$60

PEACHTREE*

General Ledger \$399/\$40
Acct Receivable \$399/\$40
Acct Payable \$399/\$40
Payroll \$399/\$40
Inventory \$399/\$40
Surveyor \$399/\$40
Property Mgt. \$799/\$40
CPA Client Write-up \$799/\$40
P5 Version Add \$129
MagiCalc \$269/\$25
"Peach Pak" Series 4 \$1195/\$na
Other less 10%

STAR COMPUTER SYSTEMS

G/L, A/R, A/P, Pay \$ 359
All 4 \$1129
Legal Time & Billing \$ 849
Property Mngmt. \$ 849

STRUCTURED SYSTEMS*

Business Packages, Call for Price

SORCIM*

SuperCalc \$269/\$na
Trans 86 \$115
Act \$157

SUPERSOFT*

Ada \$224/\$na
Diagnostic I \$ 49/\$20
Diagnostic II \$ 84/\$20
Disk Doctor \$ 84/\$20
Forth (8080 or Z80) \$149/\$30
Fortran \$219/\$30
Fortran w/Ratfor \$289/\$35
C Compiler \$174/\$20
Star Edit \$189/\$30
Scratch pad \$174/\$15
Statgraph \$174/\$15
Dataview \$174/\$20
Other less 10%

SYSTEMS PLUS

1 Module \$425/\$na
4 Modules \$1395/\$na
All 8 \$3400/\$na

TCS*

GL or AR or AP or Pay \$ 79/\$25
All 4 \$269/\$99
Compiled each \$ 99/\$25
Inventory \$ 99/\$25

UNICORN*

Mince \$149/\$25
Scribe \$149/\$25
Both \$249/\$50

WHITESMITHS*

"C" Compiler \$600/\$30
Pascal (incl "C") \$850/\$45

"PASCAL"

Pascal/MT+ Pkg \$429/\$30
Compiler \$315
Sp Prog \$175
Pascal/Z \$349/\$30
Pascal/UCSD 4.0 \$670/\$50
Pascal/M \$355/\$20

"DATA BASE"

FMS-80 \$649/\$45
dBASE II \$595/\$50
Condor II \$899/\$50

"WORD PROCESSING"

WordSearch \$179/\$50
SpellGuard \$229/\$25
VTS/80 \$259/\$65
Magic Wand \$289/\$45
Magic Spell \$269/\$25
Spell Binder \$349/\$45
Select \$495/\$na

The Word \$ 65/\$na
✓ The Word Plus \$145/\$na
✓ Palantier-I (WP) \$385/\$na

"COMMUNICATIONS"

✓ Ascum \$149/\$15
✓ BSTAM \$149/\$na
✓ BSTMS \$149/\$na
✓ Crosstalk \$139/\$na
✓ Move-It \$ 89/\$na

"OTHER GOODIES"

Micro Plan \$419/\$30
Plan 80 \$269/\$30
Target \$189/\$30
Tiny "C" \$ 89/\$50
Tiny "C" Compiler \$229/\$50
Nevada Cobol \$179/\$25
MicroStat \$224/\$25
Vedit \$130/\$15
MiniModel \$449/\$50
StatPak \$449/\$40
Micro B+ \$229/\$20
Raid \$224/\$35
String/80 \$ 84/\$20
String/80 (source) \$279/\$na
ISIS CP/M Utility \$199/\$50
Lynx \$199/\$20
SuperViz \$ 95/\$na
CP/M Power \$ 75/\$na
Mathe Magic \$ 95/\$na
✓ CIS COBOL \$765/\$na
✓ ZIP \$129/\$12

APPLE II®

INFO UNLIMITED*

EasyWriter (Prof) \$159
Datedex \$129
EasyMailer (Prof) \$129
Other less 15%

MICROSOFT*

Softcard (Z-80 CP/M) \$298
Fortran \$179
Cobol \$499
Tasc \$139

MICROPRO*

Wordstar \$269
MailMerge \$ 99
Wordstar/MailMerge \$349
SuperSort I \$159
Spellstar \$129

PERSONAL SOFTWARE/

VISICORP*

Visicalc 3.3 \$199
Desktop/Plan II \$199
Visiterm \$ 90
Visidex \$199
Visiplot \$180
Visitrend/Visiplot \$259
Visifile \$169
✓ Visischedule \$259

PEACHTREE*

G/L, A/R, A/P, Pay or Inventory (each) \$224/\$40
✓ Peach Pack \$795
✓ Systems Plus
Accounting Plus II, G/L, AR, AP or Inventory (each) \$385/\$na
(Needs G/L to run)

"OTHER GOODIES"

Micro Counter \$219
Super-Text II \$127
Data Factory \$134
DB Master \$184

16-BIT SOFTWARE

8086 SOFTWARE

✓ Supercalc \$269
✓ Wordstar (ISMPIC) \$289/\$na
Call for others

CALL TOLL FREE VISA • MASTERCHARGE

U.S. 1-800-421-4003 • CALIF. 1-800-252-4092 • LOS ANGELES 1-213-837-5141

Outside Continental U.S.—add \$10 plus Air Parcel Post • Add \$3.50 postage and handling per each item • California residents add 6% sales tax • Allow 2 weeks on checks, C.O.D. \$3.00 extra • Prices subject to change without notice. All items subject to availability. ®—Mfgs. Trademark. Blue Label \$3.00 additional per item.

THE DISCOUNT SOFTWARE GROUP

6520 Selma Ave. Suite 309 • Los Angeles, Ca. 90028 • (213) 837-5141

Int'l TELEX 499-0446 DISCOSTF LSA • USA TELEX 194-634 (Attn: 499-0446)

TWX 910-321-3597 (Attn: 499-0446)

Protecting Intellectual Property

A Primer on the Patent System

A patent is probably the most misunderstood concept that an inventor could ever foster. Protection for intellectual property is not a basic right or common law to the citizens of the United States. Patents are a grant by the sovereignty of our government. The federal bureaucracy is, in effect, voluntarily helping the inventor. The issue of a patent is a negative right in that it bars others from benefiting from the embodiment of one's ideas. A patent virtually gives the inventor a minimonopoly for 17 years.

The ultimate concern of the government is that technology is aided in its progress, which will make the country prosperous. Patents provide an incentive for investment. Also, the publication of patents gives others knowledge that enables them and society to leap forward in technology.

The historic basis for the U.S. patent system comes from the Constitution. Drafted during the Constitutional Convention in Philadelphia 1787, Article I, Section 8 states:

The Congress shall have the power . . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

All inventors must meet some basic requirements to be patentable. The list of requirements is as follows:

1. Subject Matter Requirement
2. Originality of Invention
3. Novelty
4. Utility
5. Nonobviousness
6. Statutory Bar Requirements

The subject matter for a patent must be a process, machine, composition of matter or article of manufacture. On the other hand, the list of ineligible subject matter includes "printed matter, products of nature, ideas and scientific principles." The article of manufacture is sort of the miscellaneous clause to Section 101 of Title 35

which includes almost anything not covered by the other three classes.

Originality of inventorship means that only the inventor or inventors may apply for the patent. This does not rule out that a second party could be named the assignee or owner of the patent. The assignee is the designated party to reap the benefits of a patent.

All inventions must be new or novel as required by Section 101 of Title 35. This means that an invention could not be patented if a previous patent was issued in the U.S. or another country. Similarly, if the idea was described in printed matter anywhere in the world, the idea is no longer considered novel. The invention must not be used by others in this country. Finally, the invention must not have previously been abandoned, suppressed or concealed.

The subject of a patent application must hold some commercially useful purpose that is not illegal, immoral or contrary to public policy. In addition, the device must perform as claimed.

The invention must not be obvious. The idea of the requirement is to limit the number of patents. The intent of the patent system is to reward innovative thinking, not the ability to observe the trivial. Sometimes, the obvious charge comes from some prior art in the field. Any library in the world may have a book or magazine that is a time bomb waiting to destroy the patentability of someone's invention.

Finally, there are the statutory bar requirements which discourage inventors from neglecting or concealing their ideas. Specifically, the inventor must file an application within one year of public disclosure. Public disclosure may be anything from selling the invention to telling your old college buddy about your hot new idea. The recommended course of action for inventors is to make application as soon as possible. ■

J. Kamenetz

References

- Becker, Stephen A., "Legal Protection for Computer Hardware and Software," *Byte*, Vol. 6, No. 5, May 1981, pp. 140-146.
- Bigelow, Robert P., "Is There Legal Protection for Software," *Infosystems*, March 1980, pp. 104-108.
- Burge, David A., *Patent and Trademark, Tactics and Practice*, a Wiley-Interscience Publication, John Wiley & Sons, pp. 1-153.
- Davis, Harold L., "Computer Programs and Subject Matter Patentability," *Rutgers Journal of Computers and the Law*, Vol. 6, No. 1, 1977.
- Frank, Robert J., "Patent Protection and the Computing Arts," *Computer*, July 1979, pp. 66-73.
- Freed, Roy N., "Patenting Not Appropriate for Every Program," *Software News*, July 6, 1981, pp. 20-21.
- Herndon, James, as interviewed on "Patents" by J. Kamenetz, Hamilton Standard, Windsor Locks, CT, 5 PM, July 20, 1981.
- Kern, Christopher, "Washington Tackles the Software Problem," *Byte*, Vol. 6, No. 5, May 1981, pp. 128-130, 134-138.
- Kuhn, Janet K., and Ball, Leslie D., "Protecting Software with Copyrights, Patents and Trade Secrets," *Journal of Systems Management*, December 1978, pp. 28-31.
- Lorr, Richard, "Copyright, Computers and Compulsory Licensing," *Rutgers Journal of Computers and Law*, Vol. 5, 1975, pp. 149-169.
- Morgan, Chris, "How Can We Stop Software Piracy," *Byte*, Vol. 6, No. 5, May 1981, pp. 6, 10.
- Novick, Harold L., "Copyright Infringement Versus Permissible Use," *Creative Computing*, Jan. 1980, pp. 152-153.
- Novick, Harold L., "Software Patents," *Creative Computing*, March 1980, pp. 164-165.
- Novick, Harold L., "Software Legal Forum," *Creative Computing*, May 1980, pp. 174-175.
- Novick, Harold L., "Software Legal Forum," *Creative Computing*, July 1980, pp. 144-145.
- Novick, Harold L., "Software Legal Forum," *Creative Computing*, October 1980, pp. 160-161.
- Novick, Harold L., "Software Legal Forum," *Creative Computing*, February 1981, pp. 152-153.
- Nycum, Susan Hubbell, "Legal Protection for Computer Programs," *Computer/Law Journal*, Vol. 1, Fall 1978, pp. 1-83.
- Roberts, John T., "The Current Law of Patents for Computer Software: Or Benson Revisited," *Computer/Law Journal*, Vol. 1, 1978, pp. 85-104.
- Shoor, Rita, "Users Cautioned on Extent of Trade Secret Law," *Computer World*, Nov. 24, 1980, p. 15.
- Soltysinski, Stanislaw J., "Computer Programs and Patent Laws: A Comparative Study," *Rutgers Journal of Computers and the Law*, Vol. 3, 1973, pp. 1-82.
- Wolk, Stuart R., "Patent and Procurement Law for Engineers and Managers," a course offered by the Hartford Graduate Center, Summer 1981.

MICROWAVE TELEVISION SUBSCRIPTION TELEVISION

MICROWAVE TELEVISION EDUCATION MANUAL.....\$16.25

Our updated manual includes microwave concepts, antennas, and downconverters. Includes detailed schematics and P.C. board layouts.

SUBSCRIPTION TELEVISION EDUCATION MANUAL.....\$14.95

Two scrambling & decoding systems are explored in depth. Signal capture and modification techniques are presented for educational analysis.

AMATEUR MICROWAVE RECEIVER SYSTEM.....\$169.95

Continuing in the high quality and performance that you've come to know in the HMRll, this receiver has a new design and increased gain.

INFORMATION PACKAGE ON ALL VIDEO PRODUCTS AND KITS \$2.00 ORDER INFORMATION:

Please add 5% shipping and handling. CA residents add 6% or 6 5/8% sales tax. VISA and MASTERCARD accepted.

ABEX
P.O. Box 26601 - Km
San Francisco, CA 94126-6601

**ZENITH/Heath
Users**



Double Your
5 1/4" disk storage
capacity without adding a drive.

Get twice as much from your H88 or H89 microcomputer. Our FDC-880H floppy disk controller, in conjunction with your 5 1/4" drives, for example, expands memory capacity from 256 bytes to 512 bytes per sector.

And it handles single and double-sided, single and double-density, 8" and 5 1/4" drives — simultaneously.

Call 714/275-1272 today
or write for details.



C.D.R. Systems Inc.

Controlled Data Recording Systems, Inc.
7667 Vickers St., San Diego, CA 92111

Circle 148 on Reader Service card.



NEW! for
the '89 from

MAGNOLIA
MICROSYSTEMS

DOUBLE DENSITY DISK CONTROLLER

for both 5 1/4" & 8" drives

only **\$595** complete

including CP/M™2.2

MAGNOLIA MICROSYSTEMS, INC.
2812 Thorndyke W., Seattle 98199
(206) 285-7266 (800) 426-2841

CP/M is a trademark of Digital Research.

VOICE SYNTHESIZER WITH INTERACTIVE TELEPHONE INTERFACE

For APPLE II™ compatible dial-up voice response and remote data-base access arrangements, consider a V100 series design from VYNET CORPORATION.

- Direct connect, auto-dial/answer
- Control via Touch-Tone™ detection
- Allophone (LPC) based voice synthesizer
- Includes 1,000 word vocabulary
- Editor for custom vocabulary
- Extensive application software
- Programmable buffered port
- Upgrade available for high quality LPC vocabulary
- \$395.00

Telephone interface may be purchased without synthesizer. TRS-80™ and IBM versions available soon.

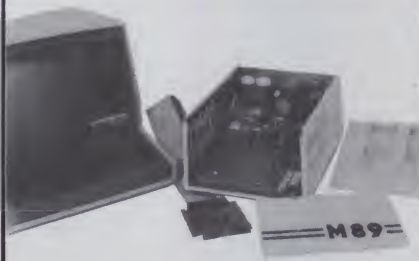
**VYNET
CORPORATION**

2405 QUME DRIVE
SAN JOSE, CA 95131
(408) 942-1037

Circle 158 on Reader Service card.

H89/Z89 USER

The M89 is an I/O expansion box
for the H89/Z89 computer, please
call or write us for more details.



Microflash Co.
4916 B Carol St.
Skokie, Ill. 60077
(312)677-4928

Circle 216 on Reader Service card.

SOFTWARE & NEWS FOR MICROPOLIS

MDOS & CP/M. For use on Micropolis S-100 drives. VG, EXIDY, COMPAL, CDS, SOL, IMSAI, POLY, BLACKHAWK. Distributor for most S/W vendors. Micropolis S/W is also compatible with some TANDON & TEAC drives.

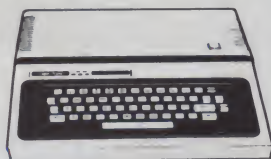
Dozens of Programs. Languages. Util's. Applic's.
Games.....Cat. \$2

	List	Sale
SPELLBINDER.....	\$495	\$319
d BASE II.....	\$695	\$589
PONY-PICK.....	\$300	\$252
BASIC/S & Z Compilers.....	\$345	\$308
UTL-1 Set of 9 MDOS utilities, incl's MDOS to CP/M, CP/M to MDOS translator.....	\$ 95	\$ 85
SORT/A, SORT B MDOS-CP/M asm lg.....	\$ 75	\$ 67
REACT. Reminder- Activity (MDOS).....	\$50	\$ 42
TEXTWRITER (MDOS&CP/M).....	\$125	\$110
BOOKKEEPING in MpBASIC or BASIC-80.....	\$250	\$189
MAILSYS I (MDOS).....	\$ 50	\$ 37
MICROPOLIS USERS GROUP, Mthly news'r yr.....	\$ 18	
MUG Lib. diss. 11 MDOS Vols. ea.....	\$3 to \$15	

Products postpaid to N. Amer. Add \$7 elsewhere. All funds in U.S. dollars. VISA & MC accepted.

DAMAN (205) 881-1697
Ste. 202, 604 Springwood Cir/Huntsville, AL 35803

AUTHORIZED TRS 80® DEALER #R491

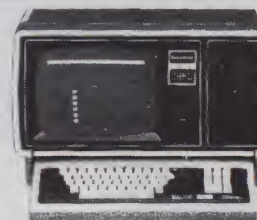


TRS-80® Color Computer With
Extended Color BASIC



26 - 1062
Model III 16K RAM
Model III, BASIC

\$815.00



26 - 4002
Model II, 64K

WE ACCEPT CHECK, MONEY ORDER, OR PHONE ORDERS WITH VISA OR MASTERCARD. SHIPPING COSTS WILL BE ADDED TO CHARGE ORDERS. DISK DRIVES, PRINTERS, PERIPHERALS, AND SOFTWARE — YOU NAME IT, WE'VE GOT IT. WRITE OR CALL FOR OUR COMPLETE PRICE LIST.

C & S ELECTRONICS, LTD. 32 EAST MAIN ST. MILAN, MICH. 48160

(313) 439-1508 (313) 439-1400

Circle 79 on Reader Service card.

C & S ELECTRONICS MART IS AN AUTHORIZED TRS 80® SALES CENTER STORE #R491

Piracy—A Serious Threat Or Unfounded Fear?

While those knowledgeable in the field all agree that software theft exists, experts disagree on the seriousness of this offense.

By Bill Grout

The fear of pervasive software piracy may arise in part from a guilty conscience.

Take the programmer who works hard putting together a computer program that will make him or her a lot of money. After devoting hours to getting the bugs out, that programmer puts a copy of the software and the documentation into an envelope—and then has second thoughts while licking the stamp.

"Will this software publisher steal my program and leave me out in the cold?" our programmer wonders. And often as not, the programmer need only look around at his or her own software library to be convinced that software piracy does go on.

At the first conference on software protection in the United Kingdom, Julian Allason, a retired software dealer, flippantly proclaimed in his opening remarks, "If I were to start again in the software business, I would be a pirate!" The crowd laughed knowingly.

Everyone knows it's often disturbingly easy to copy, and thus steal, a computer program. Addressing this same conference, a self-proclaimed software pirate asked everyone who had never made an illicit copy of a program to raise a hand. The hands raised in the entire audience

numbered less than five.

Without some kind of protection written into the program, making a copy is the easiest thing in the world. And if the program is protected, software wizards may especially enjoy making a copy.

Presently, most people are only guessing as to the amount of software piracy going on. Some would hold that the majority of software theft is done on a friendly basis—one amateur copies a favorite program and hands it over to an interested colleague. A survey of PET computer users in the United Kingdom found that for every copy bought, two and a half were stolen. Yet it's common in the industry to find executives quoting the ratio as one purchased for every ten stolen.

Wayne Green, publisher of this and several other magazines, and founder of Instant Software, has a standing offer of \$10,000 for information that will convict a software thief. That would seem temptation enough to turn one's eyes on an unsuspecting friend and pirate. Moreover, it underlines the seriousness with which many take this problem.

But how serious is the piracy problem? Should the programmer, about to submit that first software jewel, fear that the software publishing house will make a copy and develop the program without the programmer? Is dishonesty, as Julian Allason joked, the most profitable policy when it comes to software?

According to Christopher Kern's

article on the piracy problem, the relative economic significance of software theft by hobbyists is fairly small. The real problem lies with the large-scale pirate who duplicates programs on a commercial basis. But large companies, like Atari, whose revenues are aligned with computer game products and whose products are more susceptible to theft by hobbyists, may disagree. Who are the pirates one should be concerned with anyway?

Three Categories of Pirate

"I think the types of software pirate fit into three categories," said Ken Klein, chief executive officer of Stoneware Microcomputer Products, producer of the popular database manager, DB Master.

"You have the guy out there who duplicates your product and sells it for 50 bucks. That's the guy I find most odious because he is stealing in every sense of the word."

Klein doesn't feel this kind of pirate is a software dealer, but is more likely a peripheral person who has good technical knowledge and can get into the programs.

"Those are the guys I put on the top of the list to throw in jail," said Klein. "The next group of pirates is probably to be found in the computer clubs. I don't want to cast aspersions on all the clubs. Some of them carry out worthwhile functions, and I have no problems at all with them. But there are certain clubs whose main function is to buy one program and

Address correspondence to Bill Grout, 380 Chan-ning Way #171, San Rafael, CA 94903.

We have acquired the rights to all TDL software (& hardware). TDL software has long had the reputation of being the best in the industry. Computer Design Labs will continue to maintain, evolve and add to this superior line of quality software.

— Carl Galletti and Roger Amidon, owners.

Software with Manual/Manual Alone

All of the software below is available on any of the following media for operation with a Z80 CPU using the CP/M* or similar type disk operating system (such as our own TPM*).

for TRS-80* CP/M (Model I or II)
for 8" CP/M (soft sectored single density)
for 5¼" CP/M (soft sectored single density)
for 5¼" North Star CP/M (single density)
for 5¼" North Star CP/M (double density)

BASIC I

A powerful and fast Z80 Basic Interpreter with EDIT, RENUMBER, TRACE, PRINT USING, assembly language subroutine CALL, LOADGO for "chaining", COPY to move text, EXCHANGE, KILL, LINE INPUT, error intercept, sequential file handling in both ASCII and binary formats, and much, much more. It runs in a little over 12 K. An excellent choice for games since the precision was limited to 7 digits in order to make it one of the fastest around. \$49.95/\$15.

BASIC II

Basic I but with 12 digit precision to make its power available to the business world with only a slight sacrifice in speed. Still runs faster than most other Basics (even those with much less precision). \$99.95/\$15.

BUSINESS BASIC

The most powerful Basic for business applications. It adds to Basic II with random or sequential disk files in either fixed or variable record lengths, simultaneous access to multiple disk files, PRIVACY command to prohibit user access to source code, global editing, added math functions, and disk file maintenance capability without leaving Basic (list, rename, or delete). \$179.95/\$25.

ZEDIT

A character oriented text editor with 26 commands and "macro" capability for stringing multiple commands together. Included are a complete array of character move, add, delete, and display function. \$49.95/\$15.

ZTEL

Z80 Text Editing Language - Not just a text editor. Actually a language which allows you to edit text and also write, save, and recall programs which manipulate text. Commands include conditional branching, subroutine calls, iteration, block move; expression evaluation, and much more. Contains 36 value registers and 10 text registers. Be creative! Manipulate text with commands you write using Ztel. \$79.95/\$25.

TOP

A Z80 Text Output Processor which will do text formatting for manuals, documents, and other word processing jobs. Works with any text editor. Does justification, page numbering and headings, spacing, centering, and much more! \$79.95/\$25.

MACRO I

A macro assembler which will generate relocatable or absolute code for the 8080 or Z80 using standard Intel mnemonics plus TDL/Z80 extensions. Functions include 14 conditionals, 16 listing controls, 54 pseudops, 11 arithmetic/logical operations, local and global symbols, chaining files, linking capability with optional linker, and recursive/reiterative macros. This assembler is so powerful you'll think it is doing all the work for you. It actually makes assembly language programming much less of an effort and more creative. \$79.95/\$20.

MACRO II

Expands upon Macro I's linking capability (which is useful but somewhat limited) thereby being able to take full advantage of the optional Linker. Also a time and date function has been added and the listing capability improved. \$99.95/\$25.

LINKER

How many times have you written the same subroutine in each new program? Top notch professional programmers compile a library of these subroutines and use a Linker to tie them together at assembly time. Development time is thus drastically reduced and becomes comparable to writing in a high level language but with all the speed of assembly language. So, get the new CDL Linker and start writing programs in a fraction of the time it took before. Linker is compatible with Macro I & II as well as TDL/Xitan assemblers version 2.0 or later. \$79.95/\$20.

DEBUG I

Many programmers give up on writing in assembly language even though they know their programs would be faster and more powerful. To them assembly language seems difficult to understand and follow, as well as being a nightmare to debug. Well, not with proper tools like Debug I. With Debug I you can easily follow the flow of any Z80 or 8080 program. Trace the program one step at a time or 10 steps or whatever you like. At each step you will be able to see the instruction executed and what it did. If desired, modifications can then be made before continuing. It's all under your control. You can even skip displaying a subroutine call and up to seven breakpoints can be set during execution. Use of Debug I can pay for itself many times over by saving you valuable debugging time. \$79.95/\$20.

DEBUG II

This is an expanded debugger which has all of the features of Debug I plus many more. You can "trap" (i.e. trace a program until a set of register, flag, and/or memory conditions occur). Also, instructions may be entered and executed immediately. This makes it easy to learn new instructions by examining registers/memory before and after. And a RADIX function allows changing between ASCII, binary, decimal, hex, octal, signed decimal, or split octal. All these features and more add up to give you a very powerful development tool. Both Debug I and II must run on a Z80 but will debug both Z80 and 8080 code. \$99.95/\$20.

ZAPPLE

A Z80 executive and debug monitor. Capable of search, ASCII put and display, read and write to I/O ports, hex math, breakpoint, execute, move, fill, display, read and write in Intel or binary format tape, and more! on disk

APPLE

8080 version of Zapple

NEW! TPM now available for TRS-80 Model III!

TPM*

A NEW Z80 disk operation system! This is not CP/M*. It's better! You can still run any program which runs with CP/M* but unlike CP/M* this operating system was written specifically for the Z80* and takes full advantage of its extra powerful instruction set. In other words it's not warmed over 8080 code! Available for TRS-80* (Model I or II), Tarbell, Xitan DDDC, SD Sales "VERSA-FLOPPY", North Star (SD&DD), and Digital (Micro) Systems. \$79.95/\$25.

SYSTEM MONITOR BOARD (SMB II)

A complete I/O board for S-100 systems. 2 serial ports, 2 parallel ports, 1200/2400 baud cassette tape interface, sockets for 2K of RAM, 3-2708/2716 EPROM's or ROM, jump on reset circuitry. Bare board \$49.95/\$20.

ROM FOR SMB II

2KX8 masked ROM of Zapple monitor. Includes source listing \$34.95/\$15.

PAYROLL (source code only)

The Osborne package. Requires C Basic 2.
5" disks \$124.95 (manual not included)
8" disks \$ 99.95 (manual not included)
Manual \$20.00

ACCOUNTS PAYABLE/RECEIVABLE (source code only)

By Osborne. Requires C Basic 2
5" disks \$124.95 (manual not included)
8" \$99.95 (manual not included)
Manual \$20.00

GENERAL LEDGER (source code only)

By Osborne. Requires C Basic 2
5" disks \$99.95 (manual not included)
8" disks \$99.95 (manual not included)
Manual \$20.00

C BASIC 2

Required for Osborne software. \$99.95/\$20.

SYSTEM/6

TPM with utilities, Basic I interpreter, Basic E compiler, Macro I assembler, Debug I debugger, and ZEDIT text editor.

Above purchased separately costs \$339.75
Special introductory offer: Only \$179.75 with coupon!!

\$160.

This Coupon is Worth
One Hundred And Sixty Dollars
Toward The Full Price Of The
SYSTEM/6 Package
System/6 with this coupon is only \$179.95.
This is a limited time offer.

\$160.00

ORDERING INFORMATION

Visa, Master Charge and C.O.D. O.K. To order call or write with the following information.

1. Name of Product (e.g. Macro I)
2. Media (e.g. 8" CP/M)
3. Price and method of payment (e.g. C.O.D.) include credit card info, if applicable.
4. Name, Address and Phone number.
5. For TPM orders only: Indicate if for TRS 80, Tarbell, Xitan DDDC, SD Sales (5¼" or 8"). ICOM (5¼" or 8"), North Star (single or double density) or Digital (Micro) Systems.
6. N.J. residents add 5% sales tax.

Manual cost applicable against price of subsequent software purchase in any item except for the Osborne software.

For information and tech queries call
609-599-2146

These are NEW Toll Free numbers

For phone orders ONLY call toll free

1-800-458-3491 Ext. 15
In PA only 1-800-252-3567

OEMS

Many CDL products are available for licensing to OEMs. Write to Carl Galletti with your requirements.

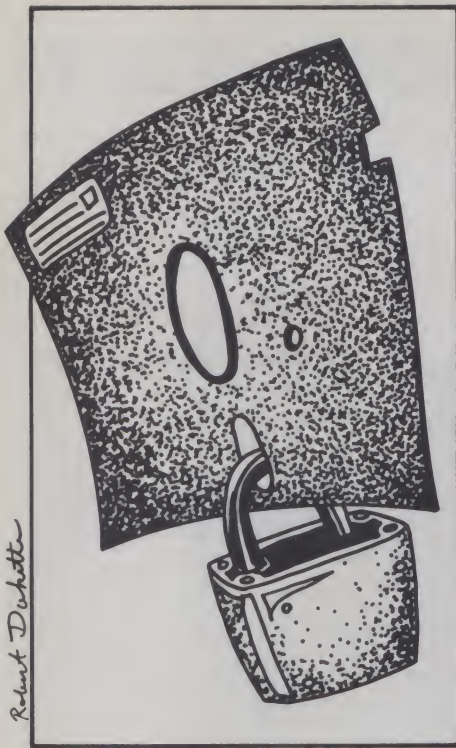
- * Z80 is a trademark of Zilog
 - * TRS-80 is a trademark for Radio Shack
 - * TPM is a trademark of Computer Design Labs. It is not CP/M*
 - * CP/M is a trademark of Digital Research
- Prices and specifications subject to change without notice.

DEALER INQUIRIES INVITED.

Circle 18 on Reader Service card.

**COMPUTER
DESIGN
LABS**

342 Columbus Avenue
Trenton, N.J. 08629



then distribute it to all members.

"A programmer has to make a certain amount of money in order to exist as a programmer full time. Every time a copy of a program he has written is stolen, it means there is less of a chance that he will get his reward, his money. And if he can't make a living at writing programs, he's going to do something else. The long-term implication of that is fewer programs. Solutions for really important problems we have in our society may not be developed."

Klein explained that a single program, DB Master, took five man years of effort to create. He emphasized this as an enormous effort to lose the profits from. "The software pirate does not have the salaries of 30 employees and the overhead of running a business to consider," added Klein.

Klein classifies the people who duplicate copies of programs and give them away to friends as a third category of pirate.

"I don't have a big quarrel with that guy. I can understand his motivation—he's just trying to be a nice guy. It's very common. If I could turn to the guy and say, 'Hey, that's not right, you shouldn't do that,' he would probably stop. These people aren't trying to make money. They're just trying to help out a friend."

When I asked Klein if he had seen a lot of software piracy, he responded that he had seen some, but not a lot.

Many dealers feel there is only nebulous information about the amount of piracy that goes on in the microcomputer industry today.

Do Pirates Abound?

"I don't know that I've ever talked to a software pirate," says Doug Carlston of Broderbund Software, developer of Apple Panic. "I'm sure piracy exists, but I'm the last person a pirate would come to to talk about it."

"It's a vague area for a lot of people. They consider the dissemination of information, the sharing of information, a virtue. You'll find that most of our published authors, if they're honest about it, would have to admit to having copyrighted material that they didn't pay for in their personal libraries. I think that's true everywhere."

Carlston doubts if a software pirate can really make a lot of money.

"How's he going to sell his product? Word of mouth, run around with stuff in the trunk of his car? I don't believe dealers do that. I know there are dealers who occasionally run off copies of games to give away as an inducement with computers that they sell. But that's unusual."

"The dealers are trying to sell wares. Hardware was once the primary product of most dealers; but most dealers with foresight now see software as increasingly important. To the extent that they support piracy, they undercut themselves."

"It's entirely possible that dealers do pirate programs. I've heard rumors of large corporations where piracy is endemic, just a joke among the employees who pass a program around to 1500 other employees. We have people who buy a payroll program and use it in 195 locations. They didn't buy 195 copies. That may be increasingly the case."

Asked if a software publishing house would covertly copy a program and then develop it without the programmer's knowledge, Carlston replied with a firm "no." He reasoned that there is a very effective grapevine among computer programmers and user groups. Carlston felt that once the word got out that a publisher was stealing new authors' software, that publisher would be out of business in no time at all.

"I don't think stores and distributors would touch pirated products. If somebody came out with another Starblazer and said he'd written it

and it was wholly original, he wouldn't get it into the stores. The retailers and distributors would be very uncomfortable; they'd call us a dozen times and ask, 'What on earth is going on?'"

When asked why distributors would hesitate to handle pirated copies, Carlston replied, "Potentially there's liability. When Atari went after all these people for the Pac Man game, they didn't just approach the software house; they approached everybody up and down the chain—a program retailer in Washington, DC, some mail order warehouses, some distributors. They said, 'We're going to get you all.'"

"Basically I don't think piracy is a problem. I don't see much sign of it. If a programmer is worried, we'll sign a nondisclosure agreement. We try to keep everything secure. We lock the programs up at night."

Carlston cautioned that occasionally a programmer sends a dozen unprotected copies out to friends for review. To the programmer's surprise, a week later there are copies all over the country. Carlston emphasized that the effectiveness of the grapevine should never be underestimated.

Carlston is one of many software publishers who expressed concern that piracy could damage a publisher's reputation. Besides the difficulties of distributing pirated products, the hint of piracy could have the effect of drying up program submissions to a publishing house.

Is Software Protected by Law?

There seems to be a consensus among people in the microcomputer industry that software is protected by law, but not by the legal system.

Court cases concerning the copyright of computer programs have in general disfavored the pirate; however, the amount of capital needed to pursue a copyright infringement makes recourse to the legal system only marginally profitable. All too often the compensation for damages falls dismally below the legal fees incurred.

Irwin Taranto, of Taranto and Associates, Inc., a software publisher specializing in business software and support services, commented on the legal dilemma.

"Even if the laws were perfect, it would cost you \$50,000 to exercise your protection. So it costs you

NORTH STAR HORIZON AND ADVANTAGE USERS:

You have access to a super communications device!

A utility program running under North Star DOS 5.2 or GDOS allows for convenient communication with remote computer systems, personal computers, and bulletin boards. Received text may be saved on disk, edited, and subsequently printed. BASIC programs may be uploaded and downloaded. This software in an enhanced version of NSCOM which was described on the January '82 issue of Microcomputing. The Advantage version uses the special function keys and includes menu-driven control of the serial data communication rate.

Introductory prices:

Horizon version: \$29.95 (Source listing \$10.00 additional)

Advantage version: \$29.95 (Source listing \$20.00 additional)

Master card and VISA card accepted.

To obtain information or order contact:

The Computer Shoppe

263 Medford Ave.

Patchogue, N.Y. 11772

Telephone: 516-758-6558

Circle 122 on Reader Service card.

FOLLOW THE STAR
NorthStar™

STOCK MANAGER

Complete system for securities database and reporting system. Provides a variety of reports, including IRS schedule D, that permit selection of data on security name, dates, status of holding, or broker in any combination. Includes data on share price, commissions, taxes. Includes separate sort program.

Requires 40K. Written in NorthStar Basic. Also available in CBASIC 2.

Please specify configuration.

Price \$49.95. First Class Postage Inc.

CT Residents include 7.5% tax.

WSR SOFTWARE ASSOCIATES

55 Lantern Road, Fairfield, CT 06430

Circle 60 on Reader Service card.

PET MAE

Disk based Macro Assembler/Editor for Commodore 2001/4001/8032

MAE is more than just an Assembler/Editor. MAE includes these files:

MAE/DOSMD.BASEXE	UART.CTL
EXTRAMON.INS	UART.MO1
EXTRAMON.EXE	UART.MO2
MAE.EXE	UART.MO3
MAE.NOT	PET.LIB
REL.REL	IEEE.LIB
REL.EXE	MLMACROS.MLIB
SECTOR.CTL	WORDP.EXE
SECTOR.PGM	WORDP.INS
SCROLL.INS	SWEET16.MLIB
SCROLL.EXE	TAPE.INS
SCROLL.REL	TAPE.EXE
STARWRITER.BAS	TAPE.REL
ASCII.BAS	PET.SOURCES.BAS

And, MAE is the compatible assembler. EHS has similar versions for Apple and Atari!

\$169.95

Send for free detailed spec sheet

Eastern House

3239 Linda Dr
Winston Salem, NC 27106
(919) 924-2889 (919) 748-8446

YOU SAVE WHEN WE BUY FOR YOU...

It's that simple! Our fee is one-fourth of your savings off list price, and it's still a better deal than mail order.

Why?

- Better prices
- Exporting
- Leasing
- Full service and support
- Access to 500 manufacturers
- Assembly integration, testing

Sample prices paid by our clients (including fee) are:

COMPUTERS

Adds Multivision	\$ 3,075.00	IBM Personal comp.	CALL
Adds Multivision I	3,074.00	Seattle boards	CALL
Alpha Micro 1030	12,047.00	IBC Cadet	4,211.00
Alpha Micro 1051	17,634.00	Micromation	CALL
Alspa AC1-2/SS	2,320.00	NEC 8001A	750.00
Altos 8000-02	2,629.00	NEC 8012A	490.00
Altos 8000-10	6,295.00	NEC 8031A	750.00
Altos 8000-15	3,585.00	NorthStar Advantage	2895.00
Altos 8600-10	7,586.00	NorthStar Adv. HD 5	4,995.00
Altos Series 5-15D	2,182.00	NorthStar Hor 64K QD	2,650.00
Altos Series 5-5D	4,372.00	Onyx 5001 MU-6	7,350.00
Apple 2 + 48K	1,208.00	Onyx 8000 MU-10	7,900.00
BMC 20 B	5,422.00	Osborne	CALL
CCS Series 300-1A	4,414.00	Sanyo 2000	2,708.00
Columbia Data	CALL	Seattle System 2	3,251.00
Cromenco System 0	3,200.00	Televideo TS-802	2,600.00
Cromenco System 1	2,946.00	Televideo TS-802H	4,550.00
Cromenco System 2	3,400.00	Televideo TS-806	5,100.00
DEC VT-180xx	3,344.00	Vector 2600	4,221.00
Dual	12,636.00	Vector 3005	5,495.00
Dynabyte	26% OFF	Vector 5005	7,308.00
Eagle II	3,796.00	Xerox 820 8"	2,995.00

PRINTERS

Amperex GP 300	3,695.00	NEC 3510	CALL
Brother, parallel	853.00	NEC 7710 R/O	2,325.00
C. Itoh F-10, daisy	1,400.00	NEC 7720 KSR	2,685.00
C. Itoh Comet II, dot	799.00	Olivetti 231	2,104.00
Diablo 630, daisy	2,098.00	Qume 9/45	2,045.00
IDS 560/G	995.00	Smith Corona TP-1	681.00
IDS Prism 80	744.00	Sellem 1, 16K+trac.	2,595.00
IDS Prism 132 column	1,430.00	Tally	CALL

DISK DRIVES, MODEMS, ETC.

Amdek Color II term.	740.00	Houston Instr. DMP-2	1,147.00
A-J 1256 modem	641.00	Houston Instr. DMP-4	1,460.00
Corvus 10 meg H.D.	3,825.00	Houston Instr. DMP-7	2,077.00
DEC VT-100 terminal	1,390.00	Morrow 20 meg H.D.	3,650.00

Call Toll Free 800-227-2288

In California (415) 376-9020

Ask about our Leasing Program. We are buying agents for overseas computer dealers and distributors.

EXPORT SERVICES available.

International Telex 470851

Mastercard, VISA at 3% handling fee. Prices subject to change without notice. Minimum fee \$150. 15% restocking charge.

Circle 98 on Reader Service card.

THE PURCHASING AGENT

1635 School Street, Suite 101, Moraga, CA 94556

\$50,000 to save \$5. The legal system isn't up to handling it. I've got ten people I could sue. I *did* sue one. It cost me \$20,000 to pursue the case. I received \$1000 in reparations. Whoopee! If I had proceeded any further it would have cost me \$50,000—this way I stopped it at \$20,000. So we do pursue legal solutions; we use our attorneys to write nasty letters. But on a practical basis it's tough."

Taranto added, however, that there has never been any form of protection written into his programs. He stated that this arose mainly from his philosophy about selling software.

"I'm in the business business. I sell business systems, not games. I sell the fact that a customer can call me at any time and get the support he needs to keep him in operation. Regardless of what his problem is, he can come in here or call on the phone.

"When someone makes a copy and gives it to a friend, no, I don't like it. But he doesn't bother me because the person who gets it is dumb. And the person who gives it is dumb. Let me tell you why.

"If I find out that a customer has

given away my program, I will never talk to him again. So he's lost my support, and loses 90 percent of the value of my program. Secondly, the person who buys it can't call up and get the support. So if it took you five, six, ten hours to solve a problem on your own, then you've used up more in the value of your time than the cost of the program to begin with.

"Generally, we don't find our customers giving the program away. They will show it, they will demonstrate it, but when someone is ready to go into operation, he comes to me. You can steal my software, but you can't steal my support.

"I believe that if you make your program useful to customers, your customers will want to see that you stay in business."

Fighting Them Off

Taranto's strategy against software piracy is inducement—claiming that the original producer of the software can best support it. Numerous other countermeasures are considered by software publishing houses.

Outside of actually bringing suit, the legal system can wield embar-

assment as one means of deterring pirates. In the case of B.B. Roberts, a self-proclaimed software pirate working out of Las Vegas, Atari hired a detective. In three days they had tracked B.B. Roberts down and prevailed on him to write an essay published under the title "Yo! Ho! Ho! And a Bottle of Trouble!"

Other alternatives include visible and invisible trademarks, execute-only ROM, and electronic black boxes designed to lock the prying pirate out.

Yet many software developers seem to have more faith in the technical genius of the pirates than in any protection system they might devise.

Jim Ayers, a computer consultant and programmer in Mill Valley, CA, commented on methods of software protection.

"These protection schemes are ridiculous," said Ayers. Ayers told of a talented young programmer who was a member of Apple Core (a San Francisco Apple computer user's club). Ayers said that the young man had written a nibble copy program that he intended to give to the Apple Core library. Some people see nibble

Circle 142 on Reader Service card.

INTERNATIONAL **Grand Prix**™
by Richard Urban of Riverbank Software, Inc.™
APPLE II+ / APPLE II PLUS+ / APPLE III+
(in emulation mode) 48K, 13 or 16 sector disk
Apple Computer, Cupertino, CA.

\$30.00 AT BETTER COMPUTER STORES

RIVERBANK™
Software Inc.

Smith's Landing Road / P.O. Box 128 / Denton, MD 21629 / (301) 479-1312

Circle 165 on Reader Service card.

**MED
SYSTEMS
SOFTWARE**

Med Systems now offers some of the finest professional software available today. More complete information is available in our full page ads in '80 *Microcomputing*, or by calling our toll free number.

PROFESSIONAL/SCIENTIFIC WORD PROCESSING
Qwerty 3.0 offers more features than any Scripsit patch available today. Like Greek letters. Over 75 new symbols. Page end indication. Footnotes. Simultaneous superscripts and subscripts. User-controlled cursor speed. Two and three column formats. Qwerty 3.0 requires at least one disk, a TRS-80 Model I or Model III, and Scripsit. \$49.95

STATISTICAL PACKAGE FOR MICROCOMPUTERS (SPM)
SPM, written by Bruce Powell Douglass, is one of the finest statistics packages available for the TRS-80. It includes descriptive statistics, one and two way analysis of variance, single and multiple variable linear regression, and single and multiple non-linear regression. Requires a TRS-80 Model I or III with disk. \$89.95

WE GUARANTEE SATISFACTION!

When ordering, please indicate Model I or Model III, and number of disk drives in your system.

MED SYSTEMS Software
P.O. BOX 2674 CHAPEL HILL, NC 27514
1-800-334-5470

copy programs as primarily a piracy tool devised to illicitly copy protected programs.

Ayers went on to explain that the young programmer's offer nearly broke up the club. Members of the user's group claimed that, had they accepted the program in their library, the club would be condoning piracy. By the time the voting to accept or reject the program was finished, all the officers of the club had threatened to resign, and the international branch of the club was preparing to drop the club's charter.

"Then one of the local software houses came to me and said they needed a programmer. I suggested they use this kid. I told them they should give him a chance to do something of value, so he wouldn't have time to write this copy program that they're so afraid of." But they declined.

Ayers' point is that many people have the skill to crack program protection systems and therefore money devoted to developing these systems may be wasted.

"It (piracy) is going to happen, I'm afraid. There's no foolproof method

of protection. But I would hope that the moral fiber of the nation is not so deeply frayed that we can't depend on honesty."

All too often
the compensation for
damages falls dismally
below the legal fees incurred.

Many software publishers agree. Of those publishers interviewed, most felt safe relying on the basic honesty of their customers. None felt that their businesses were threatened by piracy. Publishers selling business applications programs expressed faith that the average businessman wasn't interested in pirated copies of programs. The publishers believed that businessmen would buy software from legitimate dealers rather than jeopardize their business over the price of a pirated copy.

Ayers added that he had known of one computer business which seemed

to pirate software. All their customers had the same serial number on their operating systems, and they all received photocopied manuals and documentation. Ayers said that at one point the pirate had apparently even sold the same computer twice. Then his wrongdoing caught up with him. "He went out of business," said Ayers.

How Can a Programmer Get Protection?

A California lawyer versed in the issues of software copyright laws (and who did not wish to be named) stated that software authors do have some protection against unscrupulous publishers.

"Software is protected as much as anything else. He (the programmer) is protected just as much as someone who writes a book. There's nothing to stop you from copying a program except the law, the same law that stops you from taking a book to the Xerox machine and copying it. That's the same problem.

"The programmers' unease comes from two areas. On one side, the government does not enforce the

Own a TRS-80 Color Computer? Wish you had Lower Case?

For \$75.00 and five minutes of your time you can have full upper and true lowercase (not just reverse video) with the LCA-47 lowercase adapter from Micro Technical Products.

What is it?

The LCA-47 is a small PC board (1.9 x 3.6 in.) that plugs into your computer's main PC board: leaves the expansion connector free. It doesn't take up any system memory: uses a fast Bipolar Character Generator for guaranteed operation. Installation is quick and simple: no cutting or soldering required. Fully assembled, tested, and guaranteed for 1 full year.

Two switches provided on board: one to enable or disable the lowercase. The other to invert the entire screen (light characters on a dark background).

What does it provide?

The 128 characters below: improved upper case and very readable lowercase with descending tails, all available to both Basic and machine language programs.

```
!"#$%&'()*+,-./0123456789:;<=>?
!"#$%&'()*+,-./0123456789:;<=>?
@abcdefghijklmnopqrstuvwxyz[\]^_`
@ABCDEFGHIJKLMNPQRSTUVWXYZ[\]^_`
```

Custom character sets are available as an option, call for a quote.

Compatibility: The LCA-47 is fully compatible with all TRS-80C software that we know of, including Color Scriptorit. It has no effect on any semi-graphics or full-graphics modes. Also works great with Micro-Chroma-68 Kits and others using the 6847 VDG chip! The LCA-47 will not fit under the RF shield if Computerware's "16-plus" memory board is installed.

How to order: Send \$75.00 plus \$5.00 shipping in the U.S., \$10.00 elsewhere, to:

Micro Technical Products, Inc.

814 W. Keating Ave., Dept. K
Mesa, AZ 85202

Please specify computer's PC board revision letter when ordering.
Arizona residents add \$3.75 sales tax.

Phone: 602-839-8902
MC and VISA welcome.

Enjoy The SEXPLOSION

Bonus
For Charter
Subscribers!
10% Off On
All Dirty Book
Software



Subscribe Today Take a break from the space wars and shoot 'em ups. The Dirty Book will bring you the latest collection of bedroom programs and games geared to creative, joyful living and loving. Here's a great opportunity to chart your own course to greater intimacy and satisfaction in the months to come.



The Dirty Book

Read how your fellow computerists enjoy these zesty programs.

- French Post Cards • Bedtime Stories
- Dirty Old Man • Animated Comics
- Encounter • Interlude • Pornopoly
- Sex Disk • Softporn • Whatzee
- Wanna Play Footsie? • Zesty Zodiacs.
- Street Life • Love Quotient #9

Here's A New Contest You'll Love To Enter! Submit your favorite micro-computer game program to the "Dirty Book" contest. You can win an expense-paid trip to fabulous New Orleans and enjoy the exciting French Quarter and all that jazz. The "Dirty Book" will expose your bedtime games and programs to thousands of prospective buyers. Write for full details.

Circle 326 on Reader Service card.

Bourbon Street Press
3225 Danny Park, New Orleans
(Metairie), LA 70002

(504) 455-5330

(You must be of legal age to enter subscription)

Name _____

Company (if any) _____

Address _____

City _____

State _____

Zip _____

Charter Subscription

1 yr 4 issues @29.95

Single issue @9.95

Dealer Inquiries or Call in Orders

Bourbon St. Press (504) 455-5330

Signature _____

Check enclosed

CCD — Company Only

PO# _____

Visa or

MC# _____

Expiration Date _____

law—the programmer has to do that him or herself.

"On the other, we have pirates, and people see their stuff being ripped off and they haven't factored in the amount of reserve necessary to absorb those losses.

"Before the 1978 copyright act, the publishers of small professional magazines were really hurting because of photocopying. It's exactly the same now with software. You can't prevent copying of software unless you encode it in such a fashion that no one can get at it, in which case it's debatable whether you can get it copyrighted, because nobody else can read it either to see if it's been infringed.

"The copyright law existed in that form for years. There was nothing to prevent any pianist in any bar from playing somebody else's music, and yet that infringed the copyright. Then an organization called ASCAP (American Society of Composers, Authors, and Publishers) made it their business, with paid employees, to monitor the bars and saloons and anyplace else to make sure the annual license fee was paid."

The attorney favored creating a parallel situation in the software industry. Major distributors, dealers and clubs could be monitored to guard against copyright infringements.

"This is the time to do it, while the industry is still young. If it gets too big, everybody will regard it as perfectly all right to copy software. I suspect club members may even now be apprehensive—may feel that they are not being exactly honest. A few visitors monitoring these clubs, watching software being copied and writing nasty letters to the miscreants, would say 'Hey! Somebody's watching you!' This is private industry protecting itself."

To ensure protection from a legal standpoint, all the programmer has to do is register the program with the copyright office. The forms are free and uncomplicated, and the registration fee is \$10. The applicant must include two copies of the program listing (some say you need only include the first and last ten pages of the object code) and then he will have established *prima facie* evidence that the program is his. If the programmer can prove that another program has the same listing, the court will grant an injunction.

In Tujunga, CA, a new group has

formed to help fight software piracy. The Association for Software Protection (ASP) is a non-profit organization whose principal aims are to educate end-users about the legal aspects of software transactions and to ensure ethical practices within the industry.

Robin Robinson, President of ASP, estimated that only five percent of software thefts were intentionally dishonest. She felt the majority of proprietary violations occurred due to ignorance of the unique nature of computer software. The members of ASP hope to dispel the public's misconceptions surrounding software licensing agreements. Robinson also sees ASP as possibly introducing software protections to its members and helping them create a marketplace barred to the blackmarketeer.

As advice to new programmers, Robinson suggested that the programmer obtain a nondisclosure agreement from a publisher before handing over any code. Then, if a contract is offered, the programmer should consult an attorney about the license agreement.

There should also be some arrangement made to monitor the publisher who handles distribution of the program. Robinson said that, although using an attorney may seem an expensive precaution, it could save programmers their livelihood.

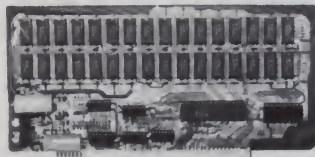
In Your Heart, Are You a Pirate?

Robinson's estimate that only five percent of program thefts are committed with intent leaves one wondering if piracy is as large an issue in the software industry as some would make it out. It is likely that estimates rise or fall proportionate to the estimator's fear of pirates. Program authors and publishers are quick to claim that piracy exists, but few see it as threatening in the long run to reputable businesses. The filching that goes on among hobbyists and buddies doesn't overly concern many software producers.

Software publishers I've talked with are sincere about safeguarding the submissions of aspiring programmers, perhaps because they readily identify with the uncertainty of the new programmer, seeing in it their own uncertainties of not long past. Advice offered time and again is that the programmer should only submit to those software publishers with good reputations. But in general, publishers felt new programmers had no great reason to fear. ■

Big sale on K's!

16K...\$149.95
32K...\$199.95
48K...\$249.95
64K...\$299.95



New JAWS-IB

The Ultrabyte Memory Board

Due to the tremendous success of our JAWS I, we were able to make a special purchase of first-quality components at below-cost prices for JAWS-IB. And we are sharing our cost saving with you. But don't be surprised if the next time you see this ad the prices have gone up substantially. Better yet, order now, and get the best memory on the market at the best price on the market.

ONE CHIP DOES IT ALL

Jaws-IB is the Rolls-Royce of all the S100 dynamic boards. Its heart is Intel's single chip 64K dynamic RAM controller. Eliminates high-current logic parts... delay lines... massive heat sinks... unreliable trick circuits. JAWS-IB solves all these problems.

LOOK WHAT JAWS-IB OFFERS YOU

Hidden refresh... fast performance... low power consumption... latched data outputs... 200 NS 4116 RAM's... on-board crystal... RAM Jumper selectable on 8K boundaries... fully socketed... solder mask on both sides of board... phantom line... designed for 8080, 8085, and Z80 bus signals... works in Explorer, Sol, Horizon, as well as all other well-designed S100 computers.

10-DAY MONEY-BACK TRIAL: Try a fully wired and tested board for 10 days — then either keep it, return it for kit, or simply return it in working condition.

Continental U.S.A. Credit Card Buyers Outside Connecticut
TO ORDER CALL TOLL FREE 800-243-7428
From Connecticut Or For Assistance:
(203) 354-9375

KB8

Please send the items checked below:

JAWS-IB kit:

- ☐ 16K.....\$149.95*
- ☐ 32K.....\$199.95*
- ☐ 48K.....\$249.95*
- ☐ 64K.....\$299.95*

JAWS-IB Fully Assembled, Wired & Tested:

- ☐ 16K.....\$179.95*
- ☐ 32K.....\$239.95*
- ☐ 48K.....\$299.95*
- ☐ 64K.....\$359.95*

EXPANSION KIT, 16K RAM Module, to expand JAWS-IB in 16K blocks up to 64K. \$59.95

*All prices plus \$2 postage and insurance (\$4.00 Canada). Connecticut residents add sales tax.

Total enclosed: \$

- ☐ Personal Check ☐ Money Order or Cashier's Check
- ☐ VISA ☐ Master Card (Bank No.)

Acct. No. _____ Exp. Date _____

Signature _____
Print Name _____

Address _____

City _____

State _____ Zip _____

NETRONICS R&D Ltd.
333 Litchfield Road, New Milford, CT 06776

— Professional — REAL ESTATE SOFTWARE

for APPLE, TRS-80 & CPM SYSTEMS

• PROPERTY MANAGEMENT SYSTEM: \$375

- Tenant History
- Late Rent Report
- Vacancy Report
- Income Report
- Auto Late Charge
- Returned Checks
- Operating Stmt
- Building Reports
- Utilities Report
- Tax Expense Report
- Prints Checks
- Prints Receipts

• PROPERTY LISTINGS/COMPARABLES: \$325

- SCREEN BY —
- 22 Items/Listing
- 1000 Listing/Disk
- Listing Memo Field
- Max/Min Price
- Units/Zone/City
- Max Price/Income
- Max Price/Sq Foot
- Min Cashflow

• REAL ESTATE ANALYSIS MODULES: \$50/Module

- Home Purchase
- Income Prop Analysis
- Property Sales
- Construction Cost/Profit
- Tax Deferred Exchange
- APR Loan Analysis
- Loan Amortization
- Depreciation/ACRS Analysis

• WORD PROCESSOR — MAGIC WAND: \$285



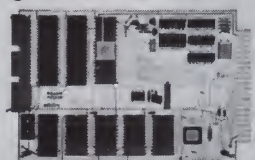
AI Computer Stores Everywhere
or Order C.O.D. Direct
Cal Residents add 6% Sales Tax
(213) 372-9419

Suite E, 1116-8th Street, Manhattan Beach, CA 90266

Circle 163 on Reader Service card.

\$73.80*

Single Board Computer



*100 block price, model MCL11

6800 MPU, serial I/O, parallel I/O, RAM, EROM, 44-pin 4 1/2" x 6 1/2" PCB

EXPANSION MODULES

RAM, ROM, CMOS RAM/battery, analog I/O, serial I/O, parallel I/O, counter/timer, 488 GPIB, EROM programmer, power fail detect/power on reset

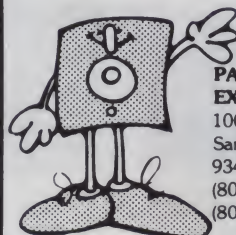


Wintek Corp.
1801 South Street
Lafayette, IN 47904
317-742-8428

Circle 172 on Reader Service card.

MEMOREX FLEXIBLE DISCS

WE WILL NOT BE UNDER-
SOLD!! Call Free (800)235-4137
for prices and information. Dealer
inquiries invited and C.O.D.'s
accepted.



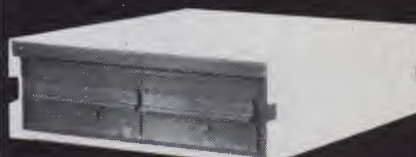
**PACIFIC
EXCHANGES**
100 Foothill Blvd.
San Luis Obispo, CA
93401. In Cal. call
(800)592-5935 or
(805)543-1037

Main/Frames Main/Frames from \$200

- 30 Models of Enclosures
- Assembled and tested
- Quasi-Coax Motherboards
- Power Supply
- Card cage and guides
- Fan, line, cord, fuse, power & reset switches



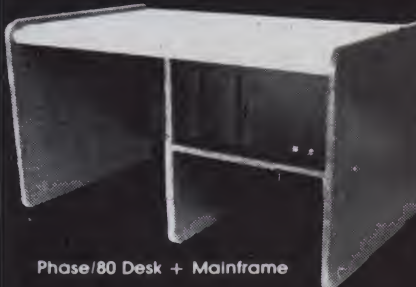
8" Floppy Main/Frame



8" Disc Enclosure



Phase/80 8" Floppy Mainframe



Phase/80 Desk + Mainframe

Write or call for our
brochure which includes our
application note:
"Building Computers —
A Recipe"

INTEGRAND

8620 Roosevelt Ave. • Visalia, CA 93291
209/733-9288

We accept BankAmericard/Visa
and MasterCard

Circle 77 on Reader Service card.

Attaché Computing

Panasonic's computer system gives you portable computing power in an attache case. The system includes a handheld computer, RS-232C interface, modem, printer and external RAM module.

By Elliott S. Kanter

You can expect two qualities from a new computer: it will be smaller, and it will be more powerful and versatile. Unfortunately, as computers shrink the hype increases. A smart pocket calculator becomes a pocket computer and the company promises add-ons that rarely come.

Panasonic's RL-H1000 handheld computer and computer system is an exception. The specifications and available options are just that—speci-

fied and available now!

The entire concept of the portable, pocket-sized computer is good. The catch is, if I carry my system in my pocket or attache case, what features do I leave behind in my office? With the RL-H1000, the answer is simple and direct—nothing. Everything is portable and part of a well-conceived and executed system (see Photo 1).

Imagine an attache case with the following:

- a computer
- an RS-232C interface
- a modem
- a printer
- an external memory (with battery-backup)
- video and TV ports
- I/O expansion interface
- an ac/dc operation providing uninterruptible power

The basic handheld computer (see Photo 2) is available in two configurations. The 1000 has 2K bytes of programmable random-access memory (RAM) and the 1400 features 4K RAM in the computer. Other than the amount of available RAM, the two models are the same. The computer measures 8 5/16 by 1 3/16 by 3 3/4 inches and weighs just under one pound. Operating power is supplied by internal rechargeable nickel-cadmium batteries or via an external 120 or 220 V ac supply. The ac supply will operate the computer and all accessories as well as place a floating charge on internal batteries.

The microprocessor is the tried-and-true 6502 running at 1.048 MHz. An internal read-only memory (ROM) of 16K bytes is standard. Three additional sockets for "snap-sules" (user installable ROM chips)

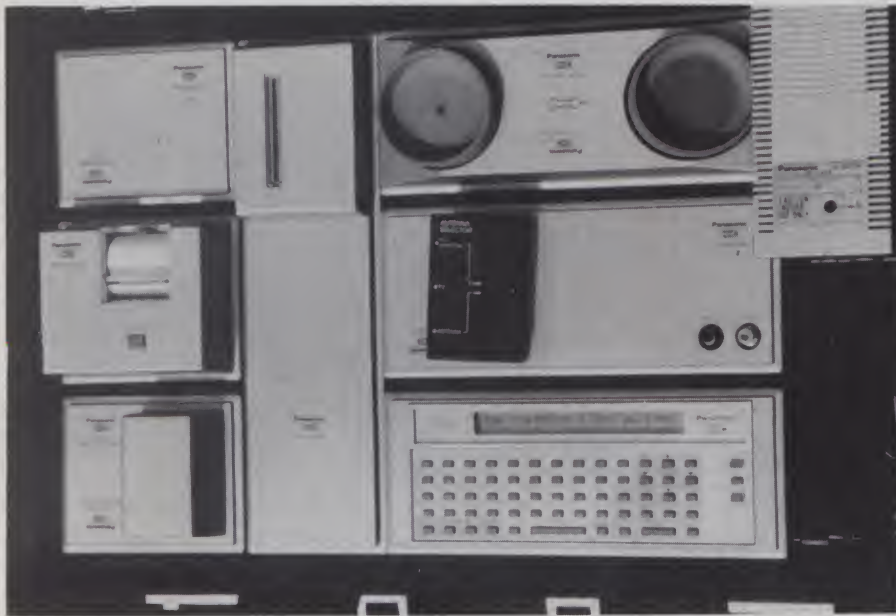


Photo 1. The complete RL-H computer system with all available peripherals in the attache case. The system includes the computer, RS-232C interface, acoustic modem, printer and external RAM module and is available from Panasonic, One Panasonic Way, Secaucus, NJ 07094.

Address correspondence to Elliott S. Kanter, 1704 Raleigh Ave., Holly Hill, FL 32017.

let you add up to 48K ROM. The internal RAM can address and control external RAM banks of up to 16K bytes each. All data residing in the internal RAM is protected by the combination of the ac supply and internal batteries. Any interruptions of normal power will cause the unit to immediately revert to battery operation.

The keyboard is laid out in the conventional QWERTY fashion with 65 positive-action keys that are user-redefinable. It's surprising, at least to someone with fat fingers, just how easy the keyboard is to use. With just a little practice, I found I could touch-type, despite what appears at first glance to be a compact and crowded keyboard. Certain keys are specified and reservable for use as functions, codes and passwords.

The display is novel and easy to read. It features a continuous, low-persistence liquid-crystal display of 8 by 159 dots. A total of eight "blip" dots above corresponding attention-getters on the panel alert you to modes and specific conditions that could, like the low battery indicator, alert you to problems. The display will scroll on command to permit additional portions of the display to become visible, much like the moving billboards. You can adjust the speed of the display, stop it entirely or reverse it with a simple command.

The handheld computer contains its own internal nickel-cadmium batteries with a specified requirement for a 12-hour initial charge. However, the system can be fully operational if the ac supply is in use, regardless of the condition of the internal batteries. The system features a 44-pin edge connector for attaching peripherals.

The compact thermal printer can be used directly with the computer. No special interface connection is necessary as is the case if you use only *one* peripheral at a time with the computer. The printer interfaces directly to the computer through the 44-pin connector or via an I/O adapter interface.

The printer is accessed and addressed with the proper selection of printer on the main computer's input/output menu. Once on, it will faithfully print all information on its 1½-inch wide paper. Like the computer, it will print both upper- and lowercase, but alas, true descenders are missing.

The printer uses 5 by 7 dot matrix with 15 character columns per line.



Photo 2. The RL-H1000/1400 computer displaying time and date information.

Full alphanumeric character sets are available, with a variety of symbols also reproducible. Character spacing is 13 characters per inch and line spacing is eight lines per inch. For simplicity, friction paper feed with no reverse is used. However, there is a paper feed button. The paper is standard 38 mm thermal, cored, with about 2200 lines of print possible per roll. The thermal print head is specified to print 500,000 lines (some 220 rolls of paper) before it will need replacing.

The compact printer measures about 4½ by 3¾ by 2½ inches and weighs about a pound, including its batteries. Fully charged batteries should support up to 1½ hours of continuous printing. However, if you use the ac supply, only the amount of paper available will limit your printing. Print quality, despite the small size, is rather good, and the speed of 1.5 lines per second is acceptable when you consider that the Micro Printer can print a 250 word page in about 100 seconds.

TV Adapter RL-P2001

The TV/video adapter lets you use either a TV (channels 3 or 4) or a dedicated monitor. User selection of the rf output will let you select a channel not in use in your area. A small adapter box allows quick and easy connections between the computer and the television set. Unlike most of these "stunt-boxes," the Panasonic engineering staff used F connectors for all interconnections. According to Dennis Reer, Panasonic's Chief Project Engineer, these connectors made it

possible to achieve a significant reliability factor and reduce potential interference, which is being regulated at present by the FCC. These are the same connectors used in a variety of cable TV systems, and most TVs already have an available F connector. Cables with F connectors at both ends are supplied.

According to published specifications and user trials, the display is 16 lines of 32 characters (512 characters) with characters formed by a 5 by 7 dot matrix. Both uppercase and lowercase letters, numerics and symbols are displayed. When the display exceeds 16 lines, each line moves up and the 17th line becomes the new 16th line.

As tested, the graphics package did not have color graphics; however, separate snapsules let you buy the graphics capabilities you require for your applications. With these easy to install snapsules, you won't be forced to buy features you don't want.

RS-232C Serial Interface RL-P3001

The serial interface together with an appropriate cable will let you connect the RL-H system to a variety of peripherals. The module fits into the computer's 44-pin connector or can be used with the I/O adapter. When using the interface, you'll see a prompt on the menu asking how you wish to configure your interface. You can choose character code lengths of five, six, seven or eight data bits with one or two stop bits and odd, even or no parity.

After you've configured your inter-

face and typed ENTER, you can select data rates from 50 to 9600 bits per second (bps) via DIP switches on the bottom of the module. Connections are via a standard 25-pin RS-232C connector. Operating power must be supplied from either the computer or via the I/O adapter.

Acoustic Modem RL-P4001

The acoustic modem provides the RL-H with a connection to the outside world via telephone lines. It will permit portable operation, even on the road at a public telephone, giving you access to other computers and databases.

The modem is simple to use. Unless testing the system, you would keep the only switch in the normal position. The modem can be connected either through the I/O adapter or directly to the handheld computer. With the modem connected you have a high-speed data-transfer system whose speed equals the sending or receiving of a 250-word typewritten page in about five seconds. The snap-sule furnished with the modem allows you to send and receive at either 110 or 300 bps. Asynchronous serial

transmission can be either full or half duplex. No power supply is present in the modem so it depends on its host for power.

I/O Adapter RL-P6001

If you want to exploit all of the capabilities of the Panasonic system, you will want to connect more than one module or peripheral at a time. With the I/O adapter, six ports are available for connection with the computer. The adapter is nothing more or less than interconnections. It contains no active components or power supplies. Each module fits into a slot and connection is made via a 44-pin connector. By using this adapter, complete computer system configurations are possible and each slot is identified on the computer's I/O menu as to device, slot number and condition (e.g., on/off). No slots are dedicated and the current position is reported via menu.

External Programmable RAM RL-P9001

Panasonic offers expandable memory, now available in 4K or 8K increments. Available memory is reported via the I/O menu. Up to six modules could be used with the I/O adapter for potential of 24K bytes of RAM. Each RAM module has its own battery backup to prevent loss of stored data.

According to the manufacturer, three non-rechargeable AAA batteries will provide up to one year of fail-safe backup. Future plans call for additional and more concentrated RAM modules as well as mass storage on a miniature floppy disk system, but the 4K or 8K RAM modules are available now.

Nitty-Gritty User Overview

As a relative newcomer to computing, I wasn't prepared for all this compact system had to offer. I wasn't prepared for one that was user-oriented and idiot-proof. Many people hesitate to take on a new technology. There is no trace of intimidation with the Panasonic system. It was designed from the ground up with the novice in mind. As you are ready to take on new and more complex functions, the computer is ready to talk and prompt you through them. For that matter, Panasonic could say that the RL-H is ready when you are, and not be stretching a point.

When you first turn the computer on, a menu appears that permits you

to use the system as a secretary, appointment book, time keeper, address book and file system. "Fine," you might say, "but how hard is it to use?" Let's look at files.

The computer asks you to select a name for your file; you do and call it MY FILE. The computer accepts this and you begin to enter into your file, in any way, manner, shape or form. Just don't exceed the 80 characters per line. Your file is in memory; you can use the search to locate objects and data with lightning speed, and you can add, delete or modify at will. You can also write programs in plain Microsoft Basic, and you address your file or program as MY PROGRAM.BAS. The .BAS tells the computer that this is a program rather than a simple file.

But the fun is only beginning. You plug the computer into the I/O adapter with a few of your favorite peripherals and you find that the basic menu now tells you that you can telecompute and typewrite. The latter is supported by a rudimentary word processing program with the ability to delete, move, add and do many of the functions that only a more expensive and obviously larger system would be capable of doing.

If you buy the first system someone offers, you usually expect less than terrific support materials, quick smudgy print jobs or no manual at all. Not the case with Panasonic. The manual is small and loose-leaf. Changes, improvements and enhancements reach you in a simple business envelope for replacement of pages, not forcing you to wait for the reprints of an entire manual. The earliest versions of the manual do have some rough edges—they seem to lose something in the translations—but again, according to Dennis Reer of Panasonic, updates and improvements are coming on a daily basis.

In a nutshell, I sat down and asked myself, who would use this system and where? I found myself with an infinite number of possibilities. It's definitely a serious computer, with a fine assortment of available peripherals. I see it as an adjunct to medicine, I see it on the road, and I see it in homes, schools and offices. What I don't see is anyone using it for games.

Some years ago, Panasonic's advertising logo was "Slightly ahead of our time." With the RL-H Computer System, those words couldn't be more true. ■

Circle 189 on Reader Service card.

TRS-80*

SAVE A BUNDLE

When you buy your
TRS-80™ equipment!

Use our toll free number to
check our price before you buy
a TRS-80™ . . . anywhere!

TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation

Don't Delay . . . Call Today



SALES COMPANY
704 W. MICHIGAN AVE.
P.O. BOX 8098 PENSACOLA FL 32505
904/438-6507
nationwide 1-800-874-1551

VOLUME 2
now available!

NIBBLE EXPRESS

TABLE OF CONTENTS

CHAMP	5
Working Out with CHAMP	8
Amper-Reader	10
Hex/Dec Codes Without Conversion	11
Auto Run and Tape Protection	12
MRS	14
Le Mans	17
Inputting Strings With Commas	19
Phantom Numeric Pad	21
Disk Snooping Part 1	22
Apple Paintbox	25
Mad Mad Cube	28
Disk Snooping Part 2	30
Applsoft Linefinder	34
Direct Keyboard Disk Commands	37
Converting Muffin to Demuffin	39
Apple STAR System	42
Disk Snooping part 3	48
Intesoft Connection part 1	52
Trap 'Em	57
Fast Data Format	60
Quick and Easy Hi-Res	62
Apple RAT	63
Binary Disk Copy	65
Disk Master	67
Trap/Step	76
Biorhythms	82
Intesoft Connection part 2	88
Teleprocessing	93
Lo-Res Screen Dump	97
Apple Tricks	100
Reset Trap	103
Mini-Amper Edit	106
How to Enter Assembler Listings	108
Free Cat for Apple DOS Users	112
M.A.P.S.	118
Amper Jump & TSort	123
Apple Artist	127
Pascal Lo-Res Graphics	131
Big CAT	132
Amper Store Recall	134
D.A.R.T.	142
Print Use	148
Intesoft connection III	152
Lazer Blaster	153
Auto Repeat Key	154
Poor Boy's LE	155
Catsup—Catalog Supervisor	157
TRAC Budget	159
TRAC Graphics	162
TRAC Plus	165
Archives	168
Intesoft connection IV	171
Command Changer • (missing the	176
DOS Remover	

NIBBLE EXPRESS VOLUME 2 NOW AVAILABLE!

The 1981 Anthology of the major articles and programs is underway! It contains up-to-date enhancements and corrections to programs which appeared in Volume 2 of NIBBLE.

Even if you have all 8 issues of NIBBLE in 1981, you'll want The Express to have updated program listings in one convenient package!

200 solidly packed pages with major programs and articles for your Apple! A MUST for your Library!

NIBBLE EXPRESS will be an invaluable reference for your Apple now and for years to come!

for only \$14.95 (plus shipping) you can make Nibble Express a permanent part of your library.

ORDER YOUR COPY NOW!

NIBBLE

P.O. Box 325
Lincoln, MA 01773

Yes! I want NIBBLE EXPRESS Vol. 2 in my library!
Here's my ☐ Check ☐ Money order

for \$14.95 plus \$1.75 postage/handling. (Outside U.S. add \$2.75 for postage/handling).

☐ Also send me NIBBLE EXPRESS Vol. 1 at \$12.95 plus \$1.75 postage/handling (outside U.S. add \$2.75 for postage/handling).

Master Card & Visa Accepted

Card # _____ Expires _____

Telephone _____

Name _____

Street _____

City _____ State _____ Zip _____

Your check or money order must accompany your order to qualify.
Outside U.S.: Checks must be drawn on a U.S. Bank.
*Apple is a registered trademark of Apple Computer Company.

Wayne Green Books

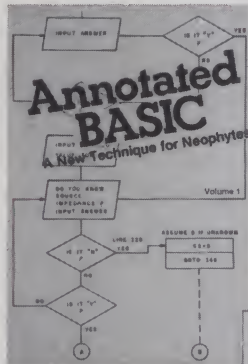
NEW
ARRIVALS

TEXTEDIT

a complete
word processing
system in kit
form.

by
Irwin Rappaport

A WAYNE GREEN
PUBLICATION



KILOBAUD KLASROOM

Learn Digital
Electronics While
Building Your Own
Computer!

By George Young
and Peter Stark



TEXTEDIT—A Complete Word Processing System in kit form

by Irwin Rappaport

TEXTEDIT is an inexpensive word processor that you can adapt to suit your needs, from writing form letters to large texts. It is written in modules, so you can load and use only those portions that you need. Included are modules that perform:

- right justification
- ASCII upper/lowercase conversion
- one-key phrase entering
- complete editorial functions
- and much more!

TEXTEDIT is written in TRS-80[®] Disk BASIC, and the modules are documented in the author's admirably clear tutorial writing style. Not only does Irwin Rappaport explain how to use TEXTEDIT; he also explains programming techniques implemented in the system.

TEXTEDIT is an inexpensive word processor that helps you learn about BASIC programming. It is written for TRS-80 Models I and III with TRSDOS 2.2/2.3 and 32K.

BK7387 \$9.97 Disk Available DS7387 \$19.97

Annotated BASIC—A New Technique for Neophytes.

BASIC programming was supposed to be simple—a beginner's programming language which was so near to English that it could be easily understood. But, in recent years, BASIC has become much more powerful and therefore much more difficult to read and understand. BASIC simply isn't basic anymore.

Annotated BASIC explains the complexities of modern BASIC. It includes complete TRS-80[®] Level II BASIC programs that you can use. Each program is annotated to explain in step-by-step fashion the workings of the program. Programs are flowcharted to assist you in following the operational sequence. And—each chapter includes a description of the new concepts which have been introduced.

Annotated BASIC deals with the hows and whys of TRS-80 BASIC programming. How is a program put together? Why is it written that way? By observing the programs and following the annotation, you can develop new techniques to use in your own programs—or modify commercial programs for your specific use.

Annotated BASIC Volume 1 contains Projecting Profits, Surveyor, Things to Do, Tax Shelter, Introduction to Digital Logic, Camelot, The Soundex Code, Deduction, Op Amp, Contractor Cost Estimating.

BK7384 \$10.95 ISBN 0-88006-028-X

AVAILABLE NOW!

Annotated BASIC Volume 2 contains Rough Lumber List, Trip Mileage, Flight Plan, OSCAR Data, SWR/Antenna Design, Supermaze, Petals Around the Rose, Numeric Analysis, Demons, Air Raid, Geography Test, Plumbing System Design.

BK7385 \$10.95 ISBN 0-88006-037-9

Order Both Volumes and Save! BK738402 \$18.95

KILOBAUD KLASROOM—

A practical course in digital electronics

By George Young and Peter Stark

Learning electronics theory without practice isn't easy. And it's no fun to build an electronics project that you can't use. Kilobaud Klassroom the popular series first published in Kilobaud Microcomputing, combines theory with practice. This is a practical course in digital electronics. It starts out with very simple electronics projects, and by the end of the course you'll construct your own working microcomputer!

Authors Young and Stark are experienced teachers, and their approach is simple and direct. Whether you're learning at home or in the classroom, this book provides you with a solid background in electronics—and you'll own a computer that you built yourself!

Kilobaud Klassroom contains Getting the Ball Rolling, Gates and Flip-Flops Explained, J.K. Flip-Flops and Clocked Logic, PC Boards and Power Supplies, Hardware Logical Functions, Voltage, Current and Power Supplies, Transistors, Diodes and OP Amps, Pulses and More Pulses, Counters and Registers, Bus Traffic Control, ROM and RAM Memories, I/O Circuitry, Parallel and Serial I/O Ports, Computer I/O III, Computer I/O IV, Computer I/O V, Processor Connections, Finally... The Kilobaud Crescendo, Eproms and Troubleshooting, Expansions and Programming, Machine-Language Programming, Assembly-Language Programming, Connecting to the Outside World.

ISBN- 0-88006-027-1 AVAILABLE NOW! BK7386 \$14.95

THE NEW WEATHER SATELLITE HANDBOOK—

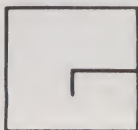
By Dr. Ralph E. Taggart WB8DQT—

Here is the completely updated and revised edition of the best-selling Weather Satellite Handbook—containing all the information on the most sophisticated spacecraft now in orbit. Dr. Taggart has written this book to serve both the experienced amateur satellite enthusiast and the newcomer. This book is an introduction to satellite watching, that tells you how to construct a complete and highly effective ground station. Not just ideas, but solid hardware designs and all the instructions necessary to operate the equipment are included. An entire chapter is devoted to microcomputers and the Weather Satellite Station, and for the thousands of experimenters who are operating stations, The New Weather Satellite Handbook details all the procedures necessary to follow the current spacecraft.

Weather Satellite contains Operational Satellite Systems, Antenna Systems, Weather Satellite Receivers, A Cathode Ray Tube (CRT) Monitor for Satellite Picture Display, A Direct-Printing Facsimile System for Weather Satellite Display, How to Find the Satellite, Test Equipment, Microcomputers and the Weather Satellite Station, Station Operations.

ISBN 0-88006-015-8 available now! BK7383 \$8.95

*TRS-80 and TRSDOS are trademarks of the Radio Shack Division of Tandy Corporation.



FOR TOLL-FREE ORDERING CALL 1-800-258-5473
WAYNE GREEN BOOKS • PETERBOROUGH NH 03458

Use the order card or itemize your order on a separate piece of paper and mail to Wayne Green Books Attn: Sales • Peterborough NH 03458. Be sure to include check or detailed credit card information. (Visa, Master Charge or American Express accepted.) No C.O.D. orders accepted. All orders add \$1.50 for the first book, postage and handling; \$1.00 each additional book; \$10.00 per book foreign air mail. Please allow 4-6 weeks after publication for delivery. Questions regarding your order? Please write to Customer Service at the above address.

ATTENTION !!

Foreign Computer Stores/ Magazine Dealers

You have a large technical audience that speaks English and is in need of the kind of microcomputer information the Wayne Green Publications group provides.

Provide your audience with the magazines they need and make money at the same time. For details on selling *Microcomputing*, *80 Microcomputing*, *Desktop Computing* and *Wayne Green Books* contact:

Sandra Joseph
World Wide Media
386 Park Ave. South
New York, N.Y. 10016
Phone—(212) 686-1520
Telex—620430

BACK ISSUES

KM3006—Single back issue
before July 1980. \$3.00
KM3507—Single back issue
July 1980 on. \$3.50
KM0005—5 your choice. . . \$10.75
Add \$1.00 per magazine for shipping.

KM0010-10 your choice. . . \$16.00
KM0025-25 your choice. . . \$27.00
KM1025-25 our choice. . . \$14.00
Add \$7.50 per order for shipping.

● **FREE BACK ISSUE CATALOGS** are yours for the asking. . . specify *73 Magazine*, and/or *Microcomputing*, back issue catalog when you send your name and address to us on a postcard.

Back Issues ● Attn. Pauline Johnstone
80 Pine St. ● Peterborough, NH 03458

Subscription Problem?

Microcomputing does not keep subscription records on the premises, therefore calling us only adds time and doesn't solve the problem.

Please send a description of the problem and your most recent address label to:

**Microcomputing
Subscription Dept.**
PO Box 981
Farmingdale, NY 11737

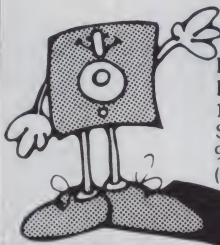
Circle 172 on Reader Service card.



Dysan

CORPORATION

Solve your disc problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and Master Card accepted.



**PACIFIC
EXCHANGES**
100 Foothill Blvd.
San Luis Obispo, CA
93401. (In Cal. call
(805) 543-1037.)

Circle 252 on Reader Service card.

VOLTAGE SURGE & TRANSIENT SUPPRESSOR



**Protects
Most
Electronic
Equipment**

The SUPPRESSOR electronically removes or reduces sudden voltage changes. It simply plugs into a power receptacle on the same circuit as the equipment being protected.

END POWER LINE SPIKES, SURGES,
HASH... Only \$29.95 ea. Dealer Inquiries
Invited.



CUESTA SYSTEMS, INC.
3440 Roberto Court
San Luis Obispo, California 93401
(805) 541-4160

Circle 279 on Reader Service card.

fullFORTH+ for APPLE/PET

Full implementation of FIG FORTH PLUS

6502 CONDITIONAL ASSEMBLER
INTEGER AND FLOATING POINT ARITHMETIC
STRING MANIPULATION WORDS
IF-DO (A form of CASE statement)
CURSOR CONTROL SCREEN EDITOR
SINGLE AND MULTI-DIMENSIONAL ARRAYS
DISK VIRTUAL MEMORY
ADDITIONAL UTILITIES INCLUDING:
SCREEN TO SCREEN COPY
CORE DUMP
PRINTER CONTROL WORDS
FORTH WORD DECOMPILER
TARGET COMPILER NOW AVAILABLE
COMPLETE DOCUMENTATION INCLUDES:
INSTALLATION GUIDE (8 PAGES)
GETTING STARTED (TUTORIAL)
(28 PAGES)
USERS GUIDE (86 PAGES)

Purchasers receive 1 year subscription to the fullFORTH+
Newsletter (Published bi-monthly)
Price \$100.00—foreign \$110.00 (Add \$2.50 ship-
ping) (PA residents add 6% sales tax)

IDPC CO. — Box 11594, Phila., Pa. 19116
or call — (215) 676-3235

Can You Contribute?

Microcomputing is looking for articles covering the most popular microcomputer systems—Apple, Atari, Commodore, Heath, IBM, Sinclair. . . . If you're an owner of a popular microcomputer system, why not share your knowledge and experiences?

● Tell us what improvements you have made or peripherals you have interfaced to your system. For example, what printers or hard disks can you add to your system?

● Have you developed any programs or modifications of programs for use on your system to meet specific needs? We're interested in new programs in virtually all areas—business, education, home, science.

● Have you uncovered any undocumented features of your system?

● Do you know of any new developments or unique applications for your system?

● What new products are available? What's worth buying? What should be avoided? We want reviews from a computer user's perspective of specific software and hardware. If you've recently bought a new product and want to tell others how great—or poor—it is, *Microcomputing* will provide you with a forum.

When writing your articles, keep in mind that *Microcomputing* readers are active computerists eager to know what peripheral equipment or applications software will let them take full advantage of their system. To assist you in the preparation of your article, we'll gladly send you a copy of our author's guidelines.

Send your manuscripts and correspondence to:
**Microcomputing
Editorial Offices**
80 Pine Street
Peterborough, N.H. 03458

Computerized A Man's Home Is His Castle

*Now every computer hobbyist's dream
of computerized home control can become a reality
with the advent of inexpensive
microprocessors coupled with BSR modules.*

By Bobby A. Jones

I wanted computerized control of my home, yet I didn't want to tie up my home computer. So I built a stand-alone computerized home controller using BSR control modules and an Intel 8085 CPU.

The BSR modules are the backbone of this controller; they're inexpensive (less than \$15 per module) and they use existing house wiring. The home controller is coupled to the BSR command module via an ultrasonic link.

A tabletop-sized chassis holds the hardware and software. You need no special knowledge of hardware or software to either build or operate this unit.

The controller can control up to 16 modules. They can be turned on or off, or, in the case of lights, can be dimmed or brightened. (See Table 1 for a reference sheet.)

The controller can handle 50 events. An event consists of a function, a day, a time and a module number. For example, one event might be "turn on module 5 Saturday and Sunday at 14:30." Another event would turn the module off. Table 2 is an example of the events I use to control my home.

A few special-event programming cases are worth noting. The "null" day is used to mark an event inactive,

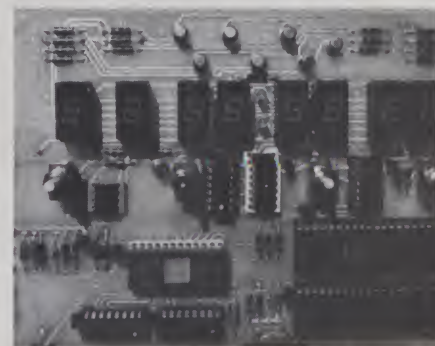
so you don't have to erase the whole event. The function and day codes marked N/U are not used at this time. Some simple error-checking is done in the software to ensure the events you program in RAM are valid. If an error in programming occurs, an error message is displayed with the location of the invalid event; an error in event 10 would read as EE 10. The software initiates this error-checking when the mode switch is returned to run mode.

The Circuit

I tried to minimize hardware wherever possible and use software in-

Functions			Day		
Off	0		Null	0	Null is used to mark an event inactive
On	1		Sun	1	
All lights on	2		Mon	2	
All off	3		Tue	3	
Dim 20%	4	The dim and bright functions will turn a module on if it wasn't previously on	Wed	4	
Dim 40%	5		Thr	5	
Dim 60%	6		Fri	6	
Dim 80%	7		Sat	7	
Bright 20%	8		Everyday	8	
Bright 40%	9		M,W,F	9	
Bright 60%	A		Sat, Sun	A	
Bright 80%	B		Mon-Fri	B	
N/U	C	Not used	Tue, Thr	C	
N/U	D	Not used	Mon, Fri	D	
N/U	E	Not used	N/U	E	Not used
N/U	F	Not used	N/U	F	Not used

Table 1. Home Controller program reference.



Component side of the PC card.

Address correspondence to Bobby A. Jones, 5251 Theresa Way, Livermore, CA 94550.

stead. This made the controller less expensive and easier to build. I chose the Intel 8085 because of its built-in interrupt circuitry and its family of available support chips.

The controller consists of only three main ICs (see Fig. 1): the 8085 CPU; the 8156, which has 256 bytes of RAM, 26 I/O lines, and a 14-bit programmable counter timer; and the 2716 EPROM used for program storage. The rest of the integrated circuits are needed for interface and drive. The 74LS175s latch the address bits for the 2716, since the 8085 has a multiplexed data and address bus. The 74LS74 latches the interrupt pulse out of the 8156's timer/counter.

Digit select and drive is done with the NE590. A 555 is used as an oscillator to drive the ultrasonic transducer at 40 kHz. It is controlled via an output line from the 8156. The power supply consists of a 7805 providing 5 V, a 74LS132 providing real-time clock interrupts at 60 Hz, and a diode switching of the nicad battery for power failures.

The schematic for the entire controller is shown in Fig. 2.

Battery backup guards against power failures. During a power failure the real-time clock is kept accurate by the internal crystal-controlled clock connected to the timer located in the 8156. This timer is used normally to refresh the display. Its frequency of oscillation provides for both flickerless digit refresh and precise real-time clock interrupts.

If power fails, the display is blanked to reduce battery drain and stand-by power is obtained from the internal nicad batteries. Any events that should have occurred during a power failure are marked internally by the software and are scheduled for completion when power returns. Therefore, the controller will play catch-up when power returns. The batteries will last several hours and outlast most power failures. When power does return, an "E" is placed in the left-most digit of the display to notify you of a possible error in time or event scheduling. If the power failure was long and the batteries went dead the message DEAD is displayed. The batteries are slowly trickle-charged by an internal resistor, so full battery potential in this instance may be a few hours in coming. The value of the internal battery charging resistor was

carefully chosen to prevent overcharge of the nicads.

Software Design

The software for this project is over 40 pages of assembly language, and is much too lengthy to publish. Those

interested can buy a copy from the author. I wrote the software in assembly language for speed and to reduce the final code size (it had to fit in one 2K×8 EPROM). I broke the software into modules and structured it as much as possible. I've included a

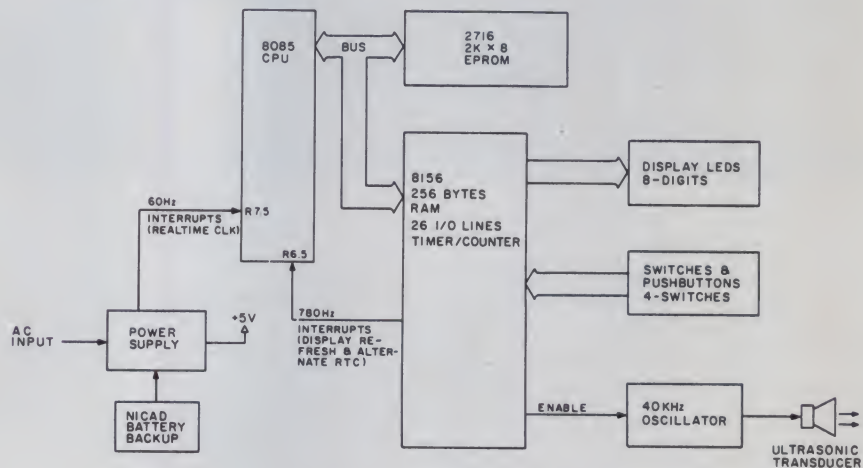


Fig. 1. Controller block diagram.

Resistors

R1-R7	56 Ohms, 1/4 Watt
R8-R14	3k Ohms, 1/4 Watt
R15	240 Ohms, 1/4 Watt
R16	1.5k Ohms, 1/4 Watt
R17	470 Ohms, 1/4 Watt
R18	Not Used
R19,R23	1k Ohms, 1/4 Watt
R20-R22	10k Ohms, 1/4 Watt
R25-R29	10k Ohms, 1/4 Watt
R24	510 Ohms, 1/4 Watt
R30	100 Ohms, 1/4 Watt
R31	51k Ohms, 1/4 Watt
R32	200 Ohms, 1/4 Watt

Capacitors

C1	4000 μ F, 15 V Electrolytic
C2-C9	.01 μ F, 50 V Cerc.
C10	1 μ F, 50 V Cerc.
C11-C12	20 pF, 500 V Silver mica
C13	.1 μ F, 50 V Cerc.

Transistors

Q1-Q8	2N2907A, NPN
-------	--------------

Integrated Circuits

U1	NE555 Timer
U2	Not used
U3	SN74LS132
U4	NE590
U5	SN74LS74

U6	2716
U7	8156
U8-U9	SN74LS175
U10	8085
U11	7805, 5 V regulator

Diodes

CR1,CR4	1N4148
CR2-CR3	1N4001
CR5-CR6	1N270

Miscellaneous Parts

D1-D8	7-Segment LEDs, HP 5082-7623
LT1-LT2	Yellow LED
UT1	J4-815, Ultrasonic xducer, GC Electronics
X1	4 MHz XTAL
S1,S3	Momentary push button switches
S2	Three position toggle switch
S4	Momentary toggle switch
T1	12.6 V, 2 A xformer, triad F44X
F1	1/2 A slo-blow fuse
B1-B6	1.2 V, AA nicad
1 EA	24 pin socket
2 EA	40 pin sockets
10 EA	14 pin sockets
3 EA	16 pin sockets
1 EA	8 pin sockets
1 EA	Line cord
1 EA	Fuse holder

Parts list.



Bottom side of PC card.



Controller with bottom cover removed.

software flow diagram (Fig. 3) and a short summary of each software module's function (Table 3).

Routines exist to allow easy debugging of all hardware functions when the unit is initially built. I also included tests for RAM memory, front panel display and the ultrasonic link and BSR modules. These test routines are entered when the unit is turned on if the event select switch is depressed. The routine that is entered is dependent upon the setting

of the mode switch. If this switch is in the edit position, then the RAM test is run. This test fills the RAM memory with a test pattern and then reads it back for comparison. If they don't match, an error message is displayed (EEEE). If all is well the display will be blank.

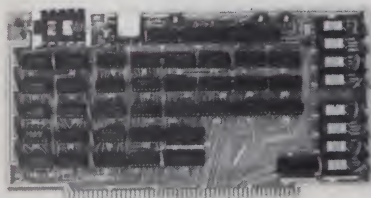
If the mode switch is in the run position, the command test is run. This test first sends the command to turn on module 1. After two seconds, the command to turn the module off

is sent. If you press the digit select once while this routine is running, the module tested is incremented by one until all 16 modules are tested, after which the test repeats with module 1. If the mode switch is in the time set position, the display test routine is entered. This test fills the display first with all zeros, then increments all displays to all ones, and so on for the 16 possible combinations (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, b, C, d, E, blank).

Circle 180 on Reader Service card.

Circle 110 on Reader Service card.

Super Compuprism Color Graphics



For the S-100 Bus. 32K of on board memory allows a 288 H. x 192V. dot matrix, for a total of 55,296 pixels. Every pixel is programmable in any one of 16 colors or 16 grey levels completely independent of all other pixels in the matrix.

Compuprism Bare Board with documentation \$45, kit \$240, ass. and tested \$280. (16K Memory 144H. x 192V.)

Super Compuprism Bare Board with documentation \$50, kit \$350, ass. and tested \$395.

(32K Memory 288H. x 192V.)

Add \$15 to A & T price for 16 level grey scale. Add \$15 to A & T price for memory management port.

Compuprism software package, includes alphanumerics, point plot, line draw, and TRS-80* graphics simulation \$20 or FREE with A & T unit.

ALL COD ORDERS SHIPPED WITHIN 72 HOURS. 4MHz MOD FOR S.D. SYSTEMS. EXPANDORAM \$10.

**J.E.S. GRAPHICS, P.O. Box 2752
Tulsa, OK 74101, (918) 742-7104**

TRS-80* is a trademark of Tandy Corp.
SARGON II** is a trademark of Hayden Book Co.

Z-80 Users You Can Use TRS-80* Software

We offer an assembled hardware interface which we guarantee will load data from TRS-80* cassettes into any Z-80 based system. (Except sealed units.) The documentation explains how to patch the TRS-80* software to your system. In fact you can virtually change your Z-80 machine into a TRS-80* without making a single hardware change. The documentation also includes an example of patching SARGON II** into a Z-80 system.

The price is \$30 or FREE with the purchase of an assembled compuprism or super compuprism unit.

A-D, D-A Board

S-100 board provides 16 channels of analog to digital input and 8 channels of digital to analog output. With on board kluge area. Total cost of board and parts less than \$120. Bare board with documentation \$45.

Another BLOCKBUSTER BARGAIN!!

Parallel, TTL Input I/O "Selectric"® TYPEWRITER / PRINTER

The manufacturer put 'em into storage to depreciate 'em... Now they're **FINALLY AVAILABLE!!** Removed from working systems, these fantastic machines have built-in driver and decoder circuitry and take TTL level, 6-bit character, plus 4-bit function input signals... Easily driven by most any micro. Use as a typewriter (with add'l "repeat" circuitry) or as a KSR I/O printer or both. Requires 115, 60Hz for typewriter motor, 5 VDC for TTL and 24 VDC for solenoids. "Table Top" style case. Each "Selectric"™ I/O machine is complete and in operational condition! Includes schematics, data, case, platen and ribbon. (Type element not included.)

I/O
SELECTRIC
PRINTER



New Type Element \$21.00 ea. I/O Selectric **\$399.00 ea.**
Add \$20 for Packaging and Handling - Pay Shipping on Delivery

GE "Terminet" 340 BAND LINE PRINTER

Featuring:

- 230 to 340 Lines per Minute!
- Fully Formed Characters
- Parallel Input!
- Microcomputer Compatible!
- 132 Columns, 64 Characters
- Nationwide Service from GE!

IDEAL FOR MICROCOMPUTERS.
HIGH SPEED LINE PRINTER



Please add
\$20.00 for
packaging-
Shipped via Truck.
Freight-Collect

These ultra-reliable, continuous-band Printers offer speeds of over 230 lines per minute, are fully operational and ready to use. Built & serviced nationwide by General Electric. Print band, schematics and data included.

115 VAC, 60Hz **\$795.00 ea.**

We Offer New and Used FLOPPY DRIVES, DISK DRIVES, PRINTERS, & MORE at BARGAIN PRICES!! Write or Call for Our Latest Flyer NOW!!!

**Computer
Products &
Peripherals
Unlimited**

WAREHOUSE
18 Granite St. Haverhill Mass 01830
MAIL ORDERS
Box 204 Newton New Hampshire 03858
TELEPHONE ORDERS
617/372-8637
Sorry, No Collect Calls.
Mastercard & VISA Accepted

Keep Your Computer Healthy...

with the Industry Standard in System Maintenance Programs.



Diagnostics II

Diagnostics II is the finest set of system maintenance routines available for microcomputers. It thoroughly checks all five areas of your computer system, pinpointing hardware problems to help keep your computer in perfect working order.

The areas of your computer which are tested include:

Memory, Printer, Terminal, Disk, and CPU

In addition to being extremely thorough, every test in Diagnostics II is also "submit"-able. The output of the tests can be logged to disk for later review.

(Requires 32k CP/M)

Diagnostics II: \$125

Manual only: \$ 15

Disk Doctor

Disk Doctor automatically recovers otherwise unrecoverable information from "crashed" diskettes. It also un-erases files.

Maybe it was a lightning storm, static from the rug, or just too late at night to be working. Whatever the cause, when the diskette "crashes" or a file is accidentally erased, valuable data or programs can be permanently lost.

Disk Doctor was designed to recover this "lost" information. It consists of five wards, each performing a specific recovery operation.

- Ward A: Verifies diskettes and locks out bad sectors.
- Ward B: Places copyable information from a "crashed" file in a good file.
- Ward C: Copies diskettes without stopping for bad sectors.
- Ward D: Un-erases files.
- Ward E: Displays a directory of recoverable erased files.

Disk Doctor was not designed for use with double sided or hard disks. But it will work in some cases.

(Requires: 48k CP/M, two drives for complete operation)

Disk Doctor: \$100

Manual only: \$ 15

Available from fine dealers everywhere, or directly from SuperSoft.

Japanese Distribution:

ASR Corporation International
3-23-8, Nishi-Shimbashi, Minato-Ku
Tokyo 105, Japan
Tel. (03) 437-5371, Telex 0242-2723

Diagnostics II available for virtually all CP/M, CP/M-86, and MS DOS compatible systems.

Disk Doctor available for virtually for all CP/M, and CP/M-86 compatible systems.

CP/M and CP/M-86 are registered trademarks of Digital Research.

SuperSoft®

FIRST IN SOFTWARE TECHNOLOGY P.O.Box 1628 Champaign, IL 61820 (217) 359-2112 Telex 270365.

Circle 181 on Reader Service card.

These three tests will test most of the hardware in the controller; if they all test okay, your assembly is probably accurate. If any errors occur you will at least have a place to start

troubleshooting from.

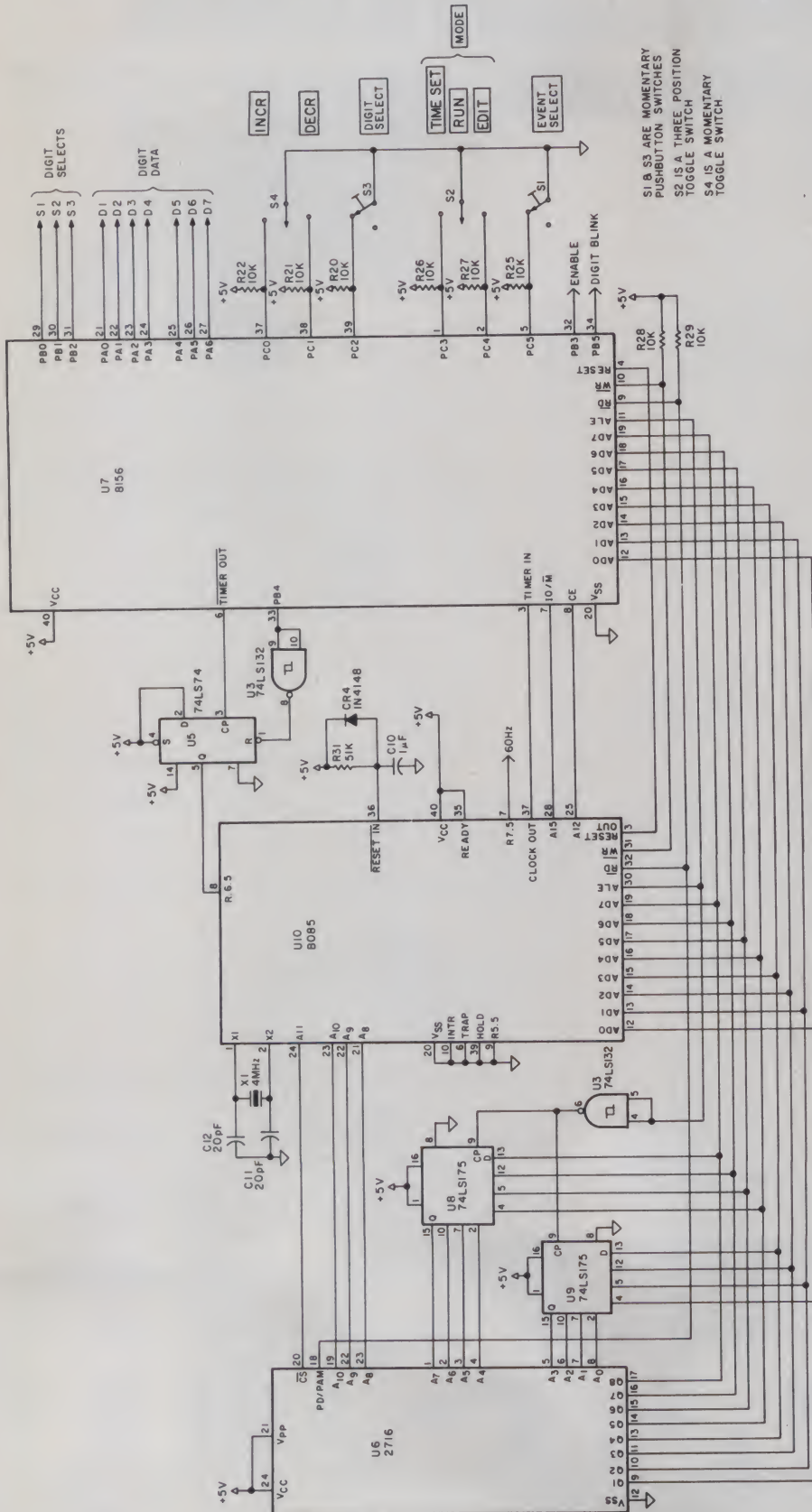
Assembly and Construction

The entire controller is contained on a single printed circuit card to

allow for easy assembly (see photos). The 8085, 8156 and 2716 should be installed using sockets. The display LEDs should be mounted on sockets to raise them up to the front panel. The 4000 uF filter capacitor and the 7805 regulator are mounted on the bottom side of the PC board due to the height of these components. I mounted the ultrasonic transducer on the underside of the controller board with a little silicon rubber.

The transducer should be wrapped with tape first so it won't short out against the board's conductors. The nicad batteries were mounted on the inside bottom cover of the controller chassis. Don't hook up the batteries until your final assembly, because you'll need to check out the power-fail features when the battery is dead.

A hole of some type should be provided in the chassis to let you operate



5 VOLT SUPPLY
STANDBY CURRENT ≈ 250 mA
MAX CURRENT ≈ 420 mA

* MOUNTED ON SOLDER SIDE OF P.C. BOARD

NOTES:
1. ALL RESISTORS 1/4 W C.C.
2. EACH IC HAS A .01 μ F BYPASS

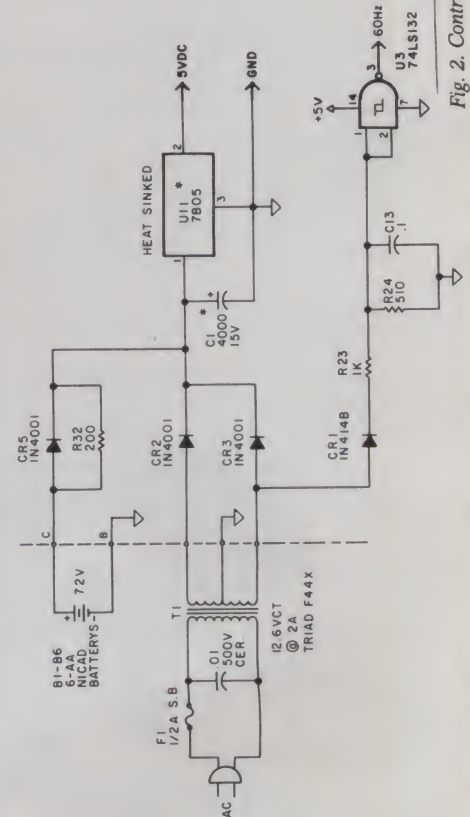


Fig. 2. Controller schematic (continued on next page).

the controller via the handheld ultrasonic controller you can buy. Be sure you buy a BSR command console that is controllable ultrasonical-

ly, or nothing will work! I put the power supply transformer in a small enclosure which plugs into an ac outlet. This cut down the size of the

tabletop chassis and removed some of the heat generated by the transformer (see Fig. 4 for wiring details). I've included a photo of my unit to give you an idea of how I built my controller. But you may choose to build yours differently.

Operation and Programming

The controller's front panel display is made up of eight yellow LEDs (I get so tired of red) and four switches. The four center digits will display the time of day when the unit is normally operating. When you flip the mode switch to time set you're able to set the four digits to the current time of day. The time starts when you set the mode switch back to the run position. The digit select switch is used to select which digit is to be edited, while the increment/decrement switch is used to do the actual editing of digits.

The edit position of the mode switch is used to edit the events in the event buffer.

The first event is edited, then the

Function	Day	Time	Module	Location	Notes
1	B	6:30	1	HEAT/AC	MORNING HEAT ON
0	B	7:30	1	HEAT/AC	MORNING HEAT OFF
1	B	16:00	1	HEAT/AC	EVENING HEAT/AC ON
0	8	22:15	1	HEAT/AC	SHUT HEAT/AC OFF
1	A	8:00	1	HEAT/AC	WEEKEND HEAT ON
6	8	17:00	2	LIV. RM. LIGHT	ON AND DIM
0	8	22:30	2	LIV. RM. LIGHT	OFF
5	8	17:30	3	FRONT PORCH LIGHT	ON AND DIM
0	8	22:30	3	FRONT PORCH LIGHT	OFF
1	B	6:00	4	COFFEE POT	ON—WEEKDAYS
0	B	8:00	4	COFFEE POT	OFF
4	8	19:00	5	GROUND LIGHTS	ON AND DIM
0	8	23:00	5	GROUND LIGHTS	OFF
1	9	5:00	6	LAWN SPRINKLER	ON M,W,F
0	9	6:00	6	LAWN SPRINKLER	OFF
5	0	20:00	7	UPSTAIRS LIGHT	AWAY LIGHT
0	0	23:30	7	UPSTAIRS LIGHT	OFF

Table 2. Sample events.

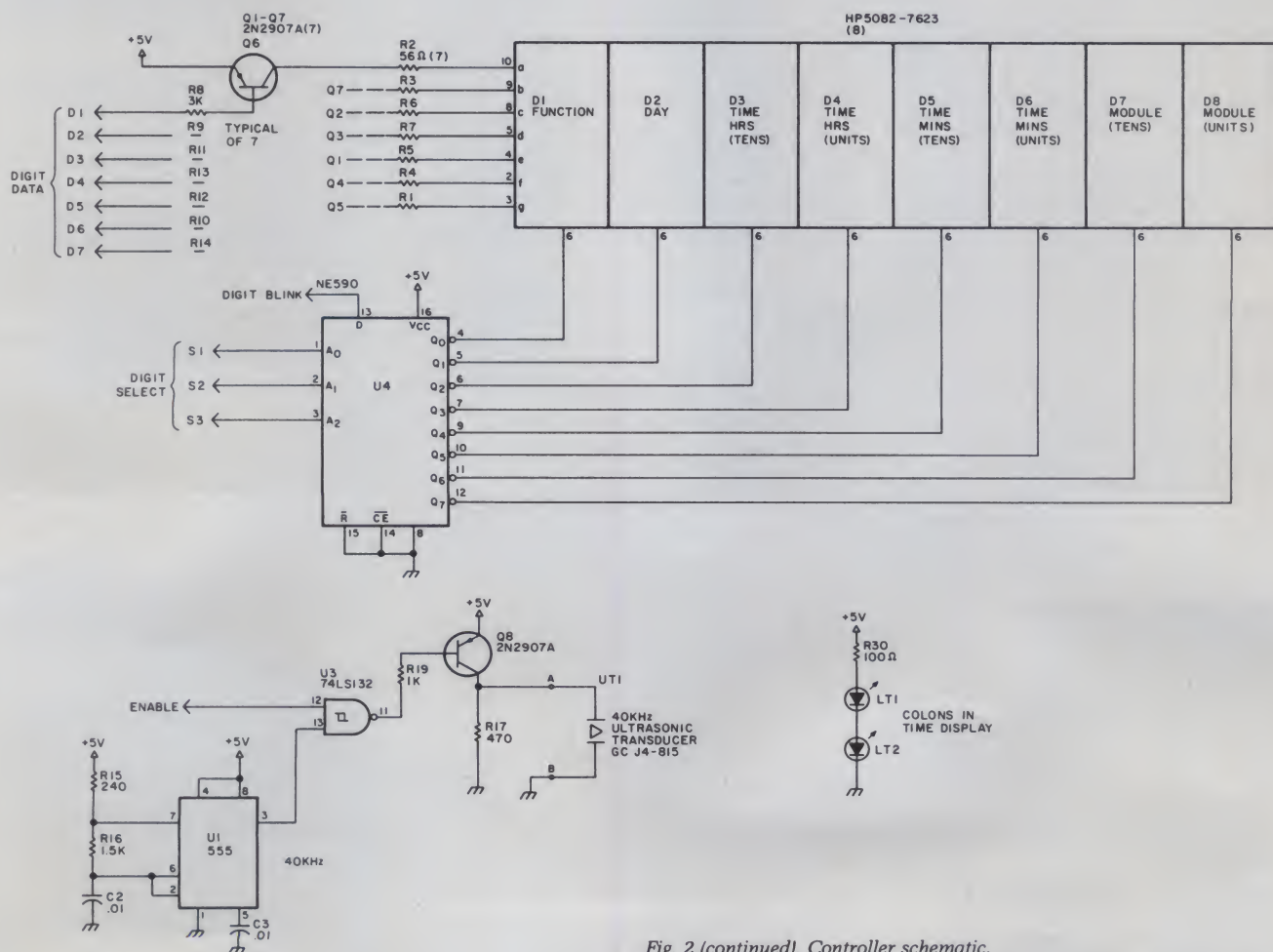


Fig. 2 (continued). Controller schematic.



Inside the controller.



Completed controller unit.

second and so on until all 50 event locations are edited. Of course you don't have to edit each and every event. You can just return the mode switch to run mode and edit mode will be stopped. The event select, digit select and increment/decrement switches work singly if hit once or increment slowly if held.

Let's go through an example to make things simpler.

We want to turn on module 4 at 6:30 PM every day. Let's also dim this module 60 percent (it's our front porch light). We'll need an event to turn the front porch light off at 10:30 PM also.

First we flip the mode switch to edit. If this is our first entry into the event buffer, then the display will show all zeros (the event buffer is filled with all zeros when power is

gone on restart); otherwise, the first event in the event buffer will be displayed. In this case, we would have to press the event select switch until the event of interest or a blank event (all zeros) was reached.

At any rate, we're at the event to be added or edited. We now press the digit increment/decrement switch until function 6 is in the first digit (this is the dim 60 percent function). Now we press the digit select switch until the next digit is selected (the digit selected blinks to indicate the active digit). Now we enter day code 8 for every day of the week using the same digit increment/decrement switch. The time is now entered by selecting these digits (time is a 24-hour clock); the time will be 18:30.

So far so good. We now select the module digits and set them for 04. If we blow it anywhere along the way we can just press the digit select switch until the offending digit is reached for edit (the digit to be edited wraps around for convenience). We now press the event select switch to increment to the next event in the event buffer. We then enter the digits 0-8-22:30-04 to turn the module off every day at 10:30 PM.

We're all through editing the events, so we return the mode switch to run mode. If the time of day appears, all is well. If an error message of EE 00 appears, we've put something in the event buffer at location 00 the software doesn't understand. We would have to reedit the event to correct the error.

The entering and editing of events is easier done than said. You should write out your events for control in some sort of orderly fashion and then

- **Initialization routine.** Used to set up 8156, clear event buffer, send DEAD message to display and check if any test routines are to be run. This routine is entered any time a total power failure occurs

- **Main routine.** Main program loop. Checks that power is up, and whether mode switch is activated. Time is set from here. Event buffer is scanned to see if any events are scheduled.

- **Event Process routine.** Used to process any events marked for execution in the event buffer.

- **Fill Memory routine.** Used to fill any area of RAM memory with a predetermined value.

- **Move Memory routine.** Used to move an area of memory from one location to another.

- **Power Check routine.** Used to switch clock from line to internal and monitor line for return of line power.

- **Program Event routine.** Used to program an event into the event buffer.

- **Real-Time Clock Set routine.** Used to set up the time of day in the real-time clock.

- **Edit Display routine.** Used to edit the event in the display.

- **Error Check routine.** Used to verify the events stored in the event buffer for proper format and content.

- **Real Time Clock routine.** Used to provide a real time clock for event scheduling.

- **Send Command routine.** Used to send a command to the controller.

- **Display Refresh routine.** Used to refresh the displays.

- **Font Conversion routine.** Used to provide correct fonts for LED displays.

- **Event Buffer Check routine.** Used to check the event buffer for any events which should be scheduled for process.

- **Test routine.** Used to provide checkout routines for initial debug. The routines, Display Test, Command Test and Memory Test, are activated from here.

Table 3. Internal software routine description.

Circle 233 on Reader Service card.

NEW 23K PERSONAL COMPUTER \$239.00 FACTORY SALE PRICE

You get the NEW APF IM-1 Full Size Powerful Computer: Includes 14K ROM with Level II BASIC built in, 9K user RAM, Color, Sound, Professional 53 keyboard, two controllers, two 10 key numeric pads, high speed cassette, AC adapter, RF Modulator, TV switchbox. Accepts TAPE-DISK-PLUG IN CARTRIDGES. It is PLUG IN EXPANDABLE. 90 day parts and labor warranty, owners quick, BASIC language manual. All this in a beautiful black and white console case for only \$239.00.

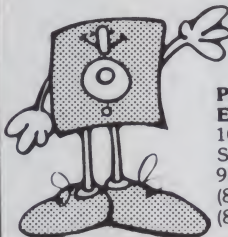
15 DAY FREE TRIAL Return within 15 days complete and undamaged for refund of purchase price.

PROTECTO ENTERPRIZES
BOX 550, BARRINGTON, IL 60010
TO ORDER PHONE 312/382-2192

DISCOUNTS	
TELEVIDEO 950	\$898
EPSON PRINTERS	
MX-80 with free GRAFTRAX option	\$467
MX-80 F/T tractor and friction feed	\$575
MX-100	\$724
VENTEL MD-212 + 300/1200 baud (\$995 list)	\$872
MULTI-TECH MODEMS	
(FCC registered direct connect)	
MT212D	
(BELL 212A compatible at 1200 baud)	\$690
MT212A	
(BELL 212A compatible at either 1200 baud or 0-300 baud)	\$840
NOVATION MODEMS	
CAT	\$138
D-CAT	\$148
AUTO-CAT	\$226
APPLE-CAT II	\$312
BLACK RIBBON CARTRIDGE FOR MX-70/80	
3/29 90 10/\$95	
Red, blue, brown, or green ribbons now available for \$3.00 additional each ribbon (mix or match)	
RELOAD YOUR OWN EPSON CARTRIDGES	
(Takes 3 minutes - Save \$\$\$)	
Reloads for MX80/MX70	5/\$19.90
Reloads for MX-100	5/\$23.10
Personal checks accepted. Please allow up to 3 weeks for checks to clear. Shipping and handling 2%	
Send orders/inquiries to:	
CTS, Incorporated of Virginia	
Post Office Box 342	
Annandale, Virginia 22003	
(703) 354-1745	

Verbatim flexible disks

Call Free (800) 235-4137 for prices and information. Dealer inquiries invited. C.O.D. and charge cards accepted.



VISA

PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA
93401. In Cal. call
(800) 592-5935 or
(805) 543-1037.

FOLLOW THE STAR
NorthStar™

STOCK MANAGER

Complete system for securities database and reporting system. Provides a variety of reports, including IRS schedule D, that permit selection of data on security name, dates, status of holding, or broker in any combination. Includes data on share price, commissions, taxes. Includes separate sort program.

Requires 40K. Written in NorthStar Basic. Also available in CBASIC 2. Please specify configuration.

Price \$49.95. First Class Postage Inc. CT Residents include 7.5% tax.

WSR SOFTWARE ASSOCIATES
55 Lantern Road, Fairfield, CT 06430

ATARI 800 Computers	\$669.95
400 Computers	\$399.95
810 Disk drive	\$44.95
ATARI accessories, software, games, call for price list.	
N/C for delivery	
NEC PC 8001 Computer 32K	749.95
8012A 32K module	499.95
8031A dual 5.1/4" disk drive SS/DD	749.95
1201 M 12" green monitor	179.95
8023 100 CPS dot matrix printer	499.95
NEC 64K system with 8012 module, green monitor	2149.95
NEC 64K system with REN TEC WEDGE, joysticks, RS232 Port, sound generator instead of 8012A	2129.95
Software and games, call.	
NEC GENERAL ACCOUNTING SYSTEM	260.00
NEC Select Word Processing with Speller & Tutor	360.00
N/C for delivery	
XEROX 820 64K computer 2.5 1/4" drives	2249.95
XEROX 820 64K computer 2.8" drives	2949.95
Software available.	
NORTH STAR Computers: call	
SUPERBRAIN	2599.95
ZENITH Z89	2099.95
All prices subject to change without notice.	

IB Computers, 10980 SW Muirwood Dr.,
Portland, OR. 97225 Phone (503) 644-2914

S-100 TERMINAL 80 CHARACTERS x 24 LINES

All This on ONE BOARD:

- Keyboard port with TYPE-AHEAD buffer
- 8275 CRT controller with light pen port fully implemented
- Two 2716's — program & character rom's
- Optional 2716 for GRAPHICS
- All screen & keyboard ram
- I/O OR Memory mapped
- Z-80 MPU — 2 Mhz operation
- Adaptable Software
- Uses only EASY-TO-GET parts
- Use in any Z-80/8080 system
- 696 Bus Compliance: D8 M16 I8 T200

Now you can afford to build that video board you've always wanted.

Introducing The VDB-A
Bare board with Documentation
\$49.50

+ \$2 s&h (Ill. res. add 6% tax)
For more info, or to order, write

Simpliway PRODUCTS CO.

P.O. Box 601
Hoffman Estates, IL 60195
Dealer Inquiries Invited

312/359-7337



TM - TANDY CORPORATION
FREE COPY OF WARRANTY
UPON REQUEST

TRS-80™

**DISCOUNT
DIRECT
PRICES**

**WRITE FOR
FREE
CATALOG**

1-800-841-0860 Toll Free

YOUR TRS-80 PURE RADIO SHACK EQUIPMENT
Learn To
PERSONAL COMPUTER "Do It Yourself"
And Save Money

Headquarters

**MICRO MANAGEMENT
SYSTEMS, INC.**

Parcel Division
DEPT. NO. 7

115C Second Ave. S.W. • Cairo, Georgia 31728
912-377-7120 Ga. Phone No.

BARGAIN PRICES!

PMC-81	16K - level II basic - up/low. case - num. keypad - built-in term. software.	\$600
LEEDEX	12" video monitor	\$140
	Green anti-glare screen filter	\$20
LNW EXPANSION	32K—disk. contr. - printer/RS232 and dual cass. ports - real time clock - handsome sturdy metal case	\$350
DISK DRIVES		
BASF	40 track - pwr/sup. - case	\$215
5" SINGLE SIDE	Bare	\$190
TANDON	80 track - pwr/sup. - case	\$385
5" SINGLE SIDE	Bare	\$325
TANDON	80 track - pwr/sup. - case	\$500
5" DOUBLE SIDE	Bare	\$440
	Extender cable	\$24
	Double case with pwr/sup.	\$90
MODEMS		
CAT ACOUSTIC	Acoustic pick-up	\$165
D-CAT	Direct connect	\$175
AUTO CAT	Auto. answering	\$225
PRINTERS		
EPSON MX-80	Standard dot matrix print	\$435
CENTRONICS 739	Hi-quality dot matrix print	\$525
SMITH CORONA TP-1	Daisy wheel—12 cps.	\$750
STARWRITER III	Daisy wheel—40 cps. (C. Itch-F-10)	\$1265

SOFTWARE
LAZY WRITER
ELECTRIC WEBSTER

MAS 80
MAXI MANAGER
BUSINESS ANALYSIS
MAILING LIST
TAX SAVER

GAMES
SCARF-MAN
ALIEN DEFENSE
SUPER VADERS

BOARDS
80 x 25 TERMINAL (TLB)

CP/M 64K SBC

BARE BOARDS

Michigan residents add tax - Postage: UPS, please call for charge
Check - money-order - Visa - MasterCard

Word processor	\$160
'Son of Microproof' - 50,000 word dictionary - correcting feature	\$145
General ledger—Accts. payable - Accts. receivable - Check register	\$85
Data base	\$90
Professional analysis and forecast	\$90
1000-plus names	\$65
Schedules A-B-C-SE-income averaging - maximum tax - alternative tax	\$110
Eat the monsters or be eaten	\$19
Super fast action with sound	\$19
Invaders galore with	\$19

RS232-C interface - reverse video - 33 graphic symbols - full cursor contr. 88 key kbd. encoder - Heathkit H19 compatible - assembled and tested	\$305
Use your 5 1/8" drs. - par/ser. ports - to 8K PROM - 4 mhz Z-80 - works w. TLB	CALL
TLB	\$69
SBC	\$90

VESPA COMPUTER OUTLET

16727 Patton, Detroit, MI 48219, (313) 538-1112

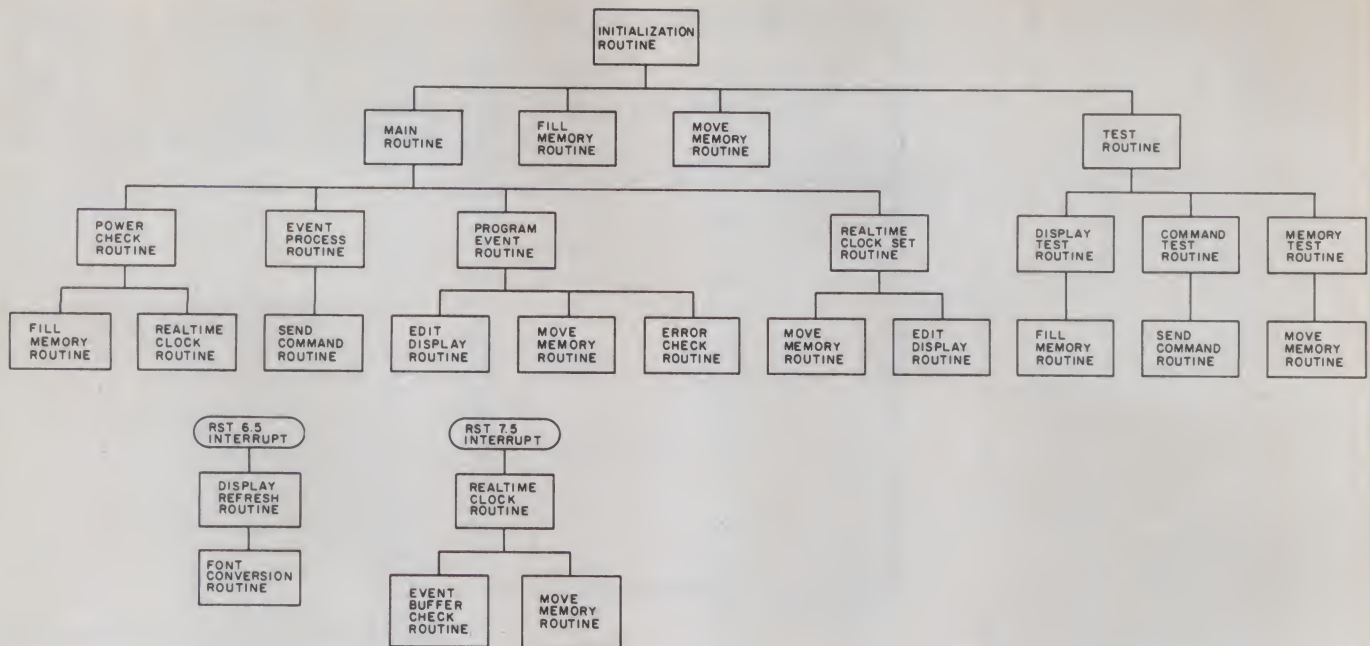


Fig. 3. Software flow diagram.

proceed to put them in all at once. The events are then in the event buffer forever until you either erase them or a long power failure occurs. I usually keep a current list of the contents of my event buffer on hand to help me edit events often changed. I also have several events that are normally marked null. These are used for controlling special lights around the house when we're gone. This gives a house that someone-is-home look to prevent burglaries.

Also, either the events that control my heating or air conditioning are marked null.

Controlling Appliances

The BSR modules come in three types: appliance, lamp control (which dims or brightens) and wall-mount, to replace a normal wall switch to allow control of lights like your front porch light (it also dims and brightens). These three modules should be adequate for most all your home control needs. There are a few special cases where more flexibility is needed. I designed a controllable heating and air conditioning unit around the standard appliance module (see Fig. 5). This lets me control the heating in the winter or the air conditioning in the summer. The versatility provided by the two thermostats located in two different areas allows for an almost unlimited number of set-back combinations.

Since this controller controls lights, heating and air conditioning, it can be

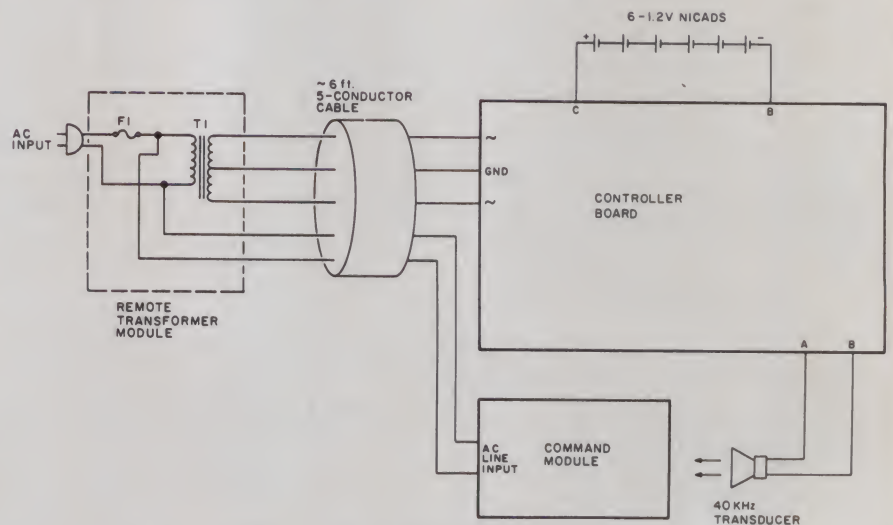


Fig. 4. Wiring diagram.

deducted as an energy-saving device on your federal income tax return. ■

References

"Computerizing a Home," S. Ciarcia, Jan. 80, *Byte*, p. 28.

"Plug-in Remote Control System," S. Ciarcia, Sept. 80, *Radio Electronics*, pp. 47-51.

The following can be obtained from the author.

Controller PC board	\$25
2716 EPROM burned with software	\$25
Software sources on floppy (CP/M)	\$15
Software listing	\$ 5
Ultrasonic transducer	\$15

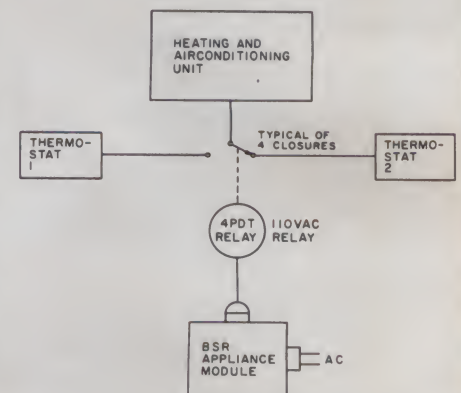


Fig. 5. Controllable heating and air conditioning.

DAISY WHEEL PRINTER

LETTER QUALITY PRINTER AND TYPEWRITER IN ONE PACKAGE

The BYTEWRITER is a new Olivetti Praxis 30 electronic typewriter with a micro-processor controlled driver added internally.



\$795
plus shipping

Dealer
Inquiries
Invited

FEATURES

- Underlining • 10, 12, or 15 characters per inch switch selectable • 2nd keyboard with foreign grammar symbols switch selectable • Changeable type daisy wheel
- Centronics compatible parallel input operates with TRS-80, Apple, Osborne, IBM and others • Cartridge ribbon • Typewriter operation with nothing to disconnect
- Service from any Olivetti dealer • Self test program built in.

BYTEWRITER

125 NORTHVIEW RD., ITHACA, N.Y. 14850
(607) 272-1132

Praxis 30 is a trademark of Olivetti Corp.
TRS-80 is a trademark of Tandy Corp.
BYTEWRITER is a trademark of Williams Laboratories.

Electronic Circuit Analysis

- Detailed analog circuit analysis
- DC and AC analysis
- Very fast, machine language
- Infinite circuits on multiple passes
- Worst case analysis
- Dynamic modification
- 64 Nodes
- Compare circuits
- Log or linear sweep
- Full file handling
- Frequency response, magnitude and phase
- Complete manual with examples
- A truly professional program with features previously available only on large systems
- Available soon for CP/M
- Available now for TRS-80 disk \$75.00

Tatum Labs
P.O. Box 722
Hawleyville, CT 06440
(203) 426-2184

Circle 350 on Reader Service card.

Circle 268 on Reader Service card.

DAISYPRINT

NEW



**ELECTRONIC
LETTER QUALITY**

PRINTER/TERMINAL/TYPEWRITER

- Parallel Centronics Interface
- Serial RS232 Interface
- 12 cps

AS LOW AS **\$645**

Micro Technology
7817 Ivanhoe Ave.
LaJolla, CA 92037
714/457-2149

Circle 316 on Reader Service card.

INDUCTIVE COUPLED MODEM

Eliminates noise, vibration problems. Originate/Answer. Bell 103. Cassette port saves data.



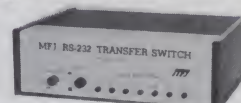
\$129⁹⁵ Money back if not delighted

MFJ-1230 INDUCTIVE COUPLED MODEM eliminates room noise, vibration caused by acoustic coupling. Gives more reliable data transfer. Used like acoustic modem. 0-300 Baud, Bell 103 compatible. Originate/answer. Half/full duplex. RS-232, TTL, CMOS compatible. Use any computer. Cassette tape ports save data. 110 VAC or 9 V batteries. Crystal controlled. Carrier detect, power LEDs. 9x1½x4". **MFJ-1231, \$39.95.** Optional cable, software for Apple II, II Plus. Plugs into game port. No serial board needed.

\$99⁹⁵ **MFJ-1108 AC POWER CENTER.** Adds convenience, prevents data loss, head bounce, equipment damage. Relay latches power off during power



transients. Multi filters isolate equipment, eliminate interaction, noise, hash. Varistors suppress spikes. 3 isolated, switched socket pairs. One unswitched for clock, etc. Lighted power, reset switch. Pop-out fuse. 3 wire, 6 ft. cord. 15 A/125 V, 1875 watts. Aluminum case. Black. 18x2¼x2 in. **MFJ-1107, \$79.95.** Like 1108 less relay. 8 sockets. 2 unswitched. Other models available.



It's like having an extra port **\$79⁹⁵**

MFJ-1240 RS-232 TRANSFER SWITCH. Switches computer between 2 peripherals (printer, terminal, modem, etc.). Like having extra port. Push button switches 10 lines (pins 2,3,4,5,6,8,11,15,17,20). Change plug or cable to substitute other lines. Push button reverses transmit-receive lines. LEDs monitor pins 2,3,4,5,6,8,20. PC board eliminates wiring, crosstalk, line interference. 3 RS-232 25 pin connectors. 7x2x6 in.

Order from MFJ and try it. If not delighted, return within 30 days for refund (less shipping).

One year unconditional guarantee.

Order yours today. Call toll free 800-647-1800. Charge VISA, MC. Or mail check, money order. Add \$4.00 each for shipping and handling.

CALL TOLL FREE ... 800-647-1800

Call 601 323 5869 for technical information, order/repair status. Also call 601 323 5869 outside continental USA and in Mississippi.

MFJ ENTERPRISES, INCORPORATED
921 Louisville Road, Starkville, MS 39759

The Heath Memory Alternative

*Double your memory at a less expensive cost
than the Heath 16K board with this do-it-yourself
memory expansion kit from Trionyx.*

By Greg Greene

You should have bought an S-100 bus computer," stated a long-time computer buddy who had invested in a North Star system.

He was right of course. The H-8 computer bus lacked space, which, coupled with a small power supply that limited the bus to nine usable slots and little industry-wide support, made it impossible to expand the H-8 to a full 56K of memory.

It's not that I didn't have enough memory boards on hand to expand with. I had three of the Heath 8K static memory boards, and two of the Godbout 12K static boards. This would give me the 48K of memory that I wanted. But I couldn't find any place to stick them in the motherboard. I already had the front panel board, the CPU board, a serial board for the terminal, a parallel board for the printer and the disk controller board for the drives. In addition, I had the fine breadboard that plugs into the bus (if you can find room), which I wanted to use to interface the H-8 to my HW 101 ham radio rig for Morse code copying. So I had more boards than space.

This left me with several alternatives. I could try to expand the motherboard to take more boards. This means a larger power supply and cabling the two boards together (with attending cross-talk problems). Many people have done this successfully with their H-8s, but I was not too enamoured with the tin-plated Heath motherboard as it was, and tying another one onto it didn't seem like the way to go.

Or I could trade in the 8K boards on

16K boards from Heath at the local store. In considering this course of action I took into account that I would be losing half of the boards' value in the trade-in and I wouldn't be gaining any more memory. Also, the price of the 16K board would be about \$750 up here in Canada, so the price for one extra slot was just too high.

It's cheaper than the
Heath 16K board,
and it came with
twice as much memory.

Last, I could seek out a new board that wouldn't take up as much space as the old ones; this meant that it had to be a minimum of 32K.

S-100 owners have long enjoyed the ability to mix and match boards from many different sources. Heathkit, on the other hand, has held a captive market for the most part. But it's beginning to change. First Godbout came on the market with their excellent 12K static design as the first alternative source for memory boards. They quickly followed this with 24 and 16K static designs. These boards were more cost effective than those from Heathkit.

Next on the memory board scene were 32K boards from DG Electronics. These dynamic boards offered transparent refresh and saved even more space. They were avail-

able only in a tested and assembled version. I gave these boards some thought, but it seemed that to bring the memory up to 56K I would still have to add another 24K with at least two other boards. Since I would eventually want to bring the memory up to full capacity anyway, why not try for a board that could do it all in one neat package.

This brought me to the Trionyx 64K board. This is also a dynamic memory board that uses the 4116 16K memory chip in the TRS-80, Apple and Heath H88 and H89. It was also available as just a bareboard that you could add to or in kit form of any 16K capacity (that is, 16, 32, 48 or 64K), or in assembled and tested versions of the same.

The board features transparent refresh, which means that the circuitry for refreshing the RAMs comes from the board itself at a time when the CPU is not using the memory. This allows it to run with no wait states if used with 300 ns memory chips or faster. The price of the board was \$400 U.S., which, with customs and duty and after exchanging the American dollar for Canadian, results in a total price of \$600. At that it is cheaper than the Heath 16K board, and it came with twice as much memory.

I ordered the kit by phone, and it was in my hands inside of three weeks. The kit comes with several pages of documentation that cover

*Address correspondence to Greg Greene, 207-885
Craigflower Road, Victoria, B.C. V9A 2X4.*

the theory and design of the board and include oscilloscope waveform patterns of various signals and some construction hints. A detailed parts list finishes off the package.

The parts list gives the parts identification number that matches with the silk-screening on the board, a colorcode identifier for resistors, and parts numbers for the rest. All you have to do is match the parts with the board and you're in business.

Assembly

When it comes to assembly instructions the documentation is definitely not Heathkit. They assume that since you will not in all likelihood be buying the board without some experience in putting things together (an H-8 for instance), you will not have any trouble with the kit. For those of you who are a little unsure, here is how I did it.

First, solder in the resistor paks; do not use sockets for these. Next, match up the silk-screen legend with the parts list and solder in all the resistors. The two small inductors (they may look like resistors) come next, followed by the sockets.

Take a look at the sockets. Notice that they are not tin plated; rather, they are top-quality gold-plated ones. Solder these so that the memory chips begin at the top left of the board.

The capacitors are next. Watch carefully around the memory section; apparently, not all the holes are used. Finish off with the voltage regulators and transistor. Notice the motherboard connector; it's also gold-plated. If Heath put out their boards with gold-plated connectors instead of tin, I think I would have a lot fewer gremlins than I now do.

Trionyx lists a gold-plated replacement motherboard connector. If you get another bare motherboard from Heath, solder it up with these and then replace the old one in the H-8; that should just about eliminate all the bugs.

After finishing the board, check it for any bridges. The board is solder masked but some of the traces are close; make sure you get all the pieces in the right spots.

Now put the board on the end of an extender card and try it for the correct voltages. If all is OK, it's time to insert the ICs. The first ones to go in are the TTLs, which fit on the right side of the board. Follow with the memory chips; they're CMOS, so



The completed 32K board from Trionyx Electronics (Box 5131-A, Santa Ana, CA 92704) plus two 12K Godbout static boards equal 56K.

handle them accordingly. Put the board back in the computer. It's addressed as the first memory the computer sees, so your other boards will have to be changed. If the front panel monitor comes on at all, try the Heath memory test. (Those of you with the disk system only need to set the PC counter to 03003, select the BC register pair and press go, since the routine is built into the controller ROM.)

If all is OK, then you have a working board. If you have any difficulty, check for bent IC pins, orientation of the parts, etc. If you still can't get it to work correctly, the problem is likely in the timing of the refresh. The documentation describes the troubleshooting procedure, and the folks at Trionyx will be glad to give you a hand if needed.

Conclusions

When I finished, my board worked perfectly, so I can't give you any tips on what trouble to expect. Again, if you take your time and don't do more at one sitting than you're comfortable with, you should expect the same results.

I enjoyed putting this board together, and was especially pleased that it worked the first time, something that does not always happen with the things I build. I have had little experience with dynamic memory, and thus was a little afraid of using it. At the same time, I was more than a little upset that owners

of the H-89 and H-88 could upgrade so cheaply. Now that we have Trionyx it is possible to do the same and have more memory, and the advantage of a mainframe with room. ■

Circle 130 on Reader Service card.

IS YOUR DISK DRIVE WORKING OVERTIME WITH ONLY MEDIA WEAR TO SHOW FOR IT?

Your floppy drives rotate disks constantly grinding dirt into the delicate surface contributing to shortened media life while generating unneeded noise and heat.

Our Drive Control Unit energizes the drive only when disk access is absolutely necessary. Media lasts longer and the system is quiet.

During drive access, the motor is energized at zero-crossings and turns off after nine seconds of idle time (adjustable).

D.C.U. is designed to be easily installed onto all popular 8 inch drives in minutes by plugging into the drive in series with the A.C. input. In most cases modifications to your system are not required.

State type of drives & controller. Assembled units are fully tested.

		Kit	Assmbld
DCU-1	Shugart Type	29.95	39.95
DCU-2	Siemens Type	29.95	39.95
DCU-BB	BigBoard	18.95	29.95
30 in Harness for 2nd Drive			3.00

**OPTRONICS
TECHNOLOGY**

716 377 0369
PO BOX 81
PITTSFORD NY 14534

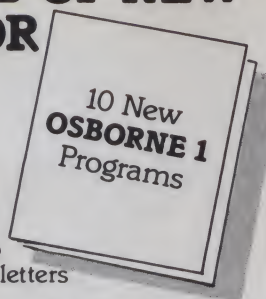
TERMS: Include \$1.50 for postage and handling. NY residents add local tax. COD, Check or Money Order accepted.

FREE CATALOG OF NEW SOFTWARE FOR OSBORNE 1*

Describes easy-to-use software for business applications: like our low-cost SPELL program that instantly converts your word processor into a spelling error locator. (No more embarrassing mistakes in letters and reports!)

Lists software designed for pure fun: like ELIZA—a robot "psychiatrist" that dispenses hilarious pseudo therapy. Great for parties.

Presents languages for advanced programmers: like C compiler, LISP, RATFOR, 8080 and Z80 macro assemblers.



Heath/Zenith and 8" CP/M* owners: catalog also lists 21 programs for your system.

To obtain your free copy, write, call or circle our Reader Service Number.

*OSBORNE 1 is a registered trademark of Osborne Computer Corp. CP/M is a registered trademark of Digital Research.

The Software Toolworks™



14478 Glorietta Drive,
Sherman Oaks, CA 91423
(213) 986-4885
Dealer inquiries invited.



is HARD COPY STORAGE a problem?

MICROCOMPUTING, as thick as it is, is more like a floppy when it comes to standing on the bookshelf. Try the **MICROCOMPUTING Library Shelf Boxes**. . . sturdy corrugated white dirt-resistant cardboard boxes which will keep them from flopping around. We have self-sticking labels for the boxes, too, not only for **MICROCOMPUTING**, but also for **73 Magazine**, **80 MICROCOMPUTING**. . . and for **CQ, QST, Ham Radio, Personal Computing, Radio Electronics, Interface Age, and Byte**. Ask for whatever stickers you want with your box order. They hold a full year of **MICROCOMPUTING**, **80 MICROCOMPUTING**. . . or **73 Magazine**. Your magazine library is your prime reference: keep it handy and keep it neat with these strong library shelf boxes. One box (BX-1000) is \$2.00, 2-7 boxes (BX-1001) are \$1.50 each, and eight or more boxes (BX-1002) are \$1.25 each. Be sure to specify which labels we should send. Have your credit card handy and call our toll-free order number 800-258-5473, or use the order card in the back of the magazine and mail to:



MICROCOMPUTING™

peterborough nh 03458

Att: Book Sales.

Shipping & Handling: \$2.00 per order
\$10.00 foreign airmail

Send Your Business To Europe Via Wayne Green International

You can introduce your products to the European market without leaving your office. All you need is a phone and the best advertising liaison between here and Europe—Wayne Green International. We represent four of the largest microcomputing magazines in Europe that will help you introduce and make your product known in the European market.

MICRO DIGEST

MICRO DIGEST is the newest resource for American businessmen to rely on for the best exposure overseas. The first publication of its kind, MICRO DIGEST caters to dealers, reps, OEMs and importers of micro and mini products. MD is the organ of the European Microcomputer Publishers Association (EMPA), publishers of the four largest computing magazines on the continent. MICRO DIGEST is published in English, French, German and Italian, and reaches a market of 312 million people. Make MICRO DIGEST your best ally in the European micro market.

CHIP

The German-speaking market has an exceptional sales potential. CHIP, the leading German magazine for desktop computers, will help you to make this market your own. Over 65% of the CHIP readership deals with computers in their business or profession. With its reputation for excellence and a paid circulation of 62,913*. CHIP is your direct line to the German microcomputer market.

*IVW Auditing (ABC Equivalent), 2nd quarter, 1981

MICRO & PERSONAL COMPUTER

MICRO & PERSONAL COMPUTER, the most sophisticated microcomputer magazine in the world, is the ideal media for introducing and marketing computer products in the Italian market today.

WAYNE GREEN INTERNATIONAL

The European Micro-Media Specialists
Peterborough, N.H. 03458 (603) 924-7138

To receive further information on these magazines, write or call:

Piergiorgio Saluti
Wayne Green International
Peterborough, New Hampshire 03458
(603) 924-7138



CORRECTIONS

Two articles in the April issue of *Microcomputing* ("Artificial Intelligence after 25 Years" by Harold Nelson, p. 32, and "Eliza—A Software Classic for Your Micro" by Thomas Parsons, p. 38) included reference to microcomputer adaptations of Joseph Weizenbaum's Eliza program. These are available from Artificial Intelligence Research Group, 921 North La Jolla Ave., Los Angeles, CA 90046, and SuperSoft, Inc., PO Box 1628 Champaign, IL 61820.

The software review of Print II (May 1982, p. 157) incorrectly lists the manufacturer's address and the price for this Apple utility. It is available from Computer Systems Design, 2139 Jackson Blvd., Rapid City, South Dakota 57701, (605) 341-3662, for \$24.95.

Circle 132 on Reader Service card.

'68' MICRO JOURNAL™

6800-6809-68000

★ The only ALL 68XX Computer Magazine

USA

1 Yr.—\$24.50 2 Yr.—\$42.50 3 Yr.—\$64.50

* Foreign Surface Add \$12 Yr. to USA Price

Foreign Air Mail Add \$35 Yr. to USA Price

* Canada & Mexico Add \$5.50 Yr. to USA Price

OK, PLEASE ENTER MY SUBSCRIPTION

Bill my: M/C ☐ — VISA ☐

Card # _____

Expiration Date _____

For ☐ 1-Yr. ☐ 2 Yrs. ☐ 3 Yrs.

Enclosed: \$ _____

Name _____

Street _____

City _____

State _____ Zip _____

68 Micro Journal
5900 Cassandra Smith Rd.
Hixson, TN 37343

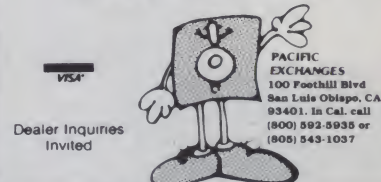
Circle 172 on Reader Service card.

Scotch® Diskettes

Rely on Scotch® diskettes to keep your valuable data safe. Dependable Scotch diskettes are tested and guaranteed error-free. The low abrasivity saves your read/write heads. They're compatible with most diskette drives.



(800)235-4137



Dealer Inquiries Invited

Circle 90 on Reader Service card.

MICROCOMPUTING



BINDERS
& FILE
CASES

order yours today

Organize and protect your valuable issues of MICROCOMPUTING with these handsome dark blue magazine binders or file cases. Each holds 1 full year of MICROCOMPUTING and has the magazine logo stamped in gold. An all metal mechanism in the binders allows easy consultation of any issue without removal. Please state years 1977 through 1983.

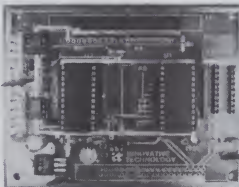
Binders—\$7.50 3 for \$21.75 6 for \$42.00
File Cases—\$5.95 ea. 3 for \$17.00 6 for \$30.00

Send check or money order only to:
MICROCOMPUTING BINDERS
P.O. Box 5120, Phila., PA 19141

Allow 6-8 weeks for delivery.

Please no C.O.D. orders, no phone orders

Circle 128 on Reader Service card.



RIO-101 REMOTE I/O CONTROL BOARD

The RIO-101 is a small board designed for serial remote I/O applications. It is based on National Semiconductor's MM54240 Asynchronous Receiver Transmitter Remote Controller (ART-RC). This circuit can be operated as either a master or a slave. It uses pulse-width modulation techniques to minimize error and to maximize frequency tolerance. Transmission time is typically 4.32 ms. It is capable of polling and controlling up to 255 slave circuits attached to a single RIO, the "data bus".

The RIO-101 supports both single-ended and differential transmission lines. It has provisions for two SN75176 differential bus transceivers. Either coaxial or twisted pair cables may be used. Transmission distances in excess of 4000' are feasible.

The RIO-101 is ideally suited for distributed I/O applications such as industrial control, environmental control, and security systems. Since only one computer interface is required, the RIO-101 is a very cost-effective alternative to parallel I/O in many applications.

Order yours today!

RIO-101 Kit (less ICs, build as master or slave)	\$39.00
RIO-101 Master (A&T with one MM54240 and one SN75176)	\$69.00
RIO-101 Slave I (A&T with one MM54240 and one SN75176)	\$69.00
RIO-101 Slave II (A&T with two MM54240 and two SN75176)	\$89.00
MM54240 IC	\$ 0.75
SN75176 IC	\$ 1.25

Terms: Check, MO, VISA, or MC in US and Canada add \$3 per item for shipping. Others add \$7 per item. US funds only. TX add 5% tax. Shipped from stock to two weeks.

INNOVATIVE TECHNOLOGY
510 Oxford Park
Garland, TX 75043 (214) 270-8393

Circle 362 on Reader Service card.

YOU CAN PAY MORE
BUT YOU CAN'T
GET MORE!

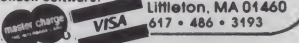


Model III 16K
\$839
Model III 48K
2 disc & RS232C
\$2059

BUY DIRECT. These are just a few of our great offers which include Printers, Modems, Computers, Peripherals, Disc Drives, Software and more. call TOLL FREE 1-800-343-8124

We have the lowest possible fully warranted prices and a full complement of Radio Shack Software.

Write for your free catalog.
245A Great Road
Littleton, MA 01460
617 • 486 • 3193



Circle 114 on Reader Service card.

INTELLIGENT PLOTTER

INEXPENSIVE COST

\$600. UP

Z FORM PLOTTING

UNIVERSAL-232,488

DRAFTING QUALITY COLOR INK PLOTTING

TECHNICAL SPECIFICATIONS:

- RESOLUTION: 005/step
- PLOT SPEED: 2 1/2"/sec. standard, higher speeds optional
- PRINT SPEED: typically 1.5 character-per-second (118 character), slower for larger characters
- PENS USED: Razor fiber tip, ball point or ink, (8 fiber tip pens furnished, PILOT razor type)
- REPEATABILITY: ± 0025" Really! Errors don't accumulate with our stepping motor design
- PLOT WIDTH: 15" with offscale tracking and loop sheet
- PLOT LENGTH: 27.3 feet
- PAPER USED: Standard sprocket feed printer paper, Z fold or roll (Samples furnished)

GRAPHICS SOFTWARE

SEND-CALL FOR LIT.
208 634 0177

X AND Y ENTERPRISES
Dept. K
Box 796 Huntsville, ALA. 35804

This Publication
is available in Microform.

University Microfilms
International

Please send additional information
for _____

Name _____

Institution _____

Street _____

City _____

State _____ Zip _____

300 North Zeeb Road, Dept. P.R., Ann Arbor, MI. 48106

This Printer Builds Character(s)

Create a character set for your particular application with the Base 2 dot matrix printer.

Listing 1. Microsoft Basic program (printed in sample character font) to read and load data into the printer.

```

1 REM OHS MICRO COMPUTER SERVICES JULY 1981
2 REM BASE 2 COMPUTER CHARACTER FONT GENERATION
3 DEFINT I,K,C:DIM C(127,5)
4 FOR I=32TO90:FOR K=1TO5:READ C(I,K):NEXT K,I
5 FOR I=91TO96:FOR K=1TO5: C(I,K)=0:NEXT K,I
6 FOR I=65TO90:FOR K=1TO5: C(I+32,K)=C(I,K):NEXT K,I
7 FOR I=123TO127:FOR K=1TO5: C(I,K)=0:NEXT K,I
8 LPRINTCHR$(27);CHR$(75);
9 FOR I=32TO127:FOR K=1TO5
10  I8=C(I,K)+128
11  LPRINTCHR$(I8);
12 NEXT K,I
13 LPRINTCHR$(27);CHR$(76);
14 PRINT"FINISHED WITH LOADING COMPUTER FONT"
15 REM LPRINTCHR$(27);CHR$(77); TO REGULAR FONT
31 REM COMPUTER FONT DATA SETS FOLLOW
32 DATA 0,0,0,0,0
33 DATA 0,3,79,3,0
34 DATA 3,7,0,7,3
35 DATA 20,127,20,127,20
36 DATA 36,127,42,127,18
37 DATA 35,19,8,100,98
38 DATA 48,95,79,40,16
39 DATA 0,0,3,7,0
40 DATA 24,60,66,65,0
41 DATA 0,65,66,60,24
42 DATA 18,12,62,12,18
43 DATA 8,8,62,8,8
44 DATA 0,64,48,48,0
45 DATA 0,12,12,12,12
46 DATA 0,0,96,96,0
47 DATA 96,48,24,4,2
48 DATA 62,97,97,97,62
49 DATA 1,97,127,96,96
50 DATA 121,73,73,73,79
51 DATA 73,73,73,127,120
52 DATA 15,15,8,120,124
53 DATA 79,73,73,121,120
54 DATA 127,81,81,83,112
55 DATA 3,97,113,9,7
56 DATA 112,127,73,127,112
57 DATA 15,9,9,121,127
58 DATA 0,108,108,0,0
59 DATA 64,52,52,0,0
60 DATA 48,48,36,66,0

```

By Peter R. Ohs

The new Base 2 dot matrix printer lets you define and design different character fonts.

I wanted to create my own character set for mailing labels. I first tried to configure a character set similar to the one used on the bottom of checks. I needed some method of designing and defining all the characters so that I could draw, verify and review the characters. Using the word processor, I finally came up with a page full of the diagrams shown in Fig. 1.

To obtain a road map and checklist of all the various characters I needed to design, I wrote a short program that printed the ASCII code and the character represented by this code (see Table 1). I also felt that I didn't need lowercase along with the special ASCII codes 91 to 96 and 123 to

1	.	.	.	.	.
2	.	.	.	.	.
4	.	.	.	.	.
8	.	.	.	.	.
16	.	.	.	.	.
32	.	.	.	.	.
64	.	.	.	.	.

Fig. 1. Diagram used to create character set.

Peter Ohs (4605 Westridge Place, Camp Springs, MD 20748) is the owner of Ohs Microcomputer Services.

More

127. I used the uppercase alphabetic set to define the lowercase set.

I designed each character with a pencil. I then coded each of the characters and wrote them into a data statement, with the line number of the data statement being equal to its ASCII code. This line-numbering system made verification and correction easy.

To tell Base 2 what type of character you want, use the following system. For example, consider the design of the number 8 (Fig. 2). With the binary numbering system to the left of each character, it became easy to code the five numbers necessary for the Base 2 to interpret this figure. The

```

1 . X X X .
2 . X . X .
4 . X . X .
8 . X X X .
16 X X . X X
32 X X . X X
64 X X X X X

```

Fig. 2. Designing the number 8.

Listing 1 continued.

```

61 DATA 54,54,54,54,54
62 DATA 0,66,36,48,48
63 DATA 7,3,89,5,3
64 DATA 12,18,45,45,46
65 DATA 112,127,9,9,127
66 DATA 127,127,73,79,120
67 DATA 127,65,65,67,115
68 DATA 127,127,65,65,62
69 DATA 127,121,73,73,73
70 DATA 127,15,9,9,9
71 DATA 127,127,65,81,119
72 DATA 127,120,8,127,120
73 DATA 0,120,127,0,0
74 DATA 112,64,64,127,112
75 DATA 127,112,24,36,66
76 DATA 112,127,64,64,64
77 DATA 127,98,8,98,127
78 DATA 127,4,8,112,127
79 DATA 127,67,67,67,127
80 DATA 127,121,9,9,15
81 DATA 127,65,81,97,127
82 DATA 127,9,9,127,112
83 DATA 111,105,73,73,121
84 DATA 3,3,127,1,1
85 DATA 127,64,64,127,127
86 DATA 31,32,64,63,15
87 DATA 127,112,8,112,127
88 DATA 99,21,8,21,99
89 DATA 3,4,120,116,3
90 DATA 115,89,77,71,99

```

ALL PRINTER VALUES FOR PRINTER: ORIGINAL FONT

```

32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
! " # $ % & ' ( ) * + , - . /

48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
0 1 2 3 4 5 6 7 8 9 : ; < = > ?

64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
@ A B C D E F G H I J K L M N O

80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
P Q R S T U V W X Y Z [ \ ] ^ _

96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
` a b c d e f g h i j k l m n o

112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
p q r s t u v w x y z { | } ~ *

```

ALL PRINTER VALUES FOR PRINTER: COMPUTER FONT

```

32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
' " # $ % & ' ( ) * + , - . /

48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
0 1 2 3 4 5 6 7 8 9 : ; < = > ?

64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
@ A B C D E F G H I J K L M N O

80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
P Q R S T U V W X Y Z

96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111
A B C D E F G H I J K L M N O

112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
P Q R S T U V W X Y Z

```

Table 1. ASCII code and corresponding characters.

DON'T BUY SOFTWARE UNTIL YOU READ THIS

Until now, you had only two ways to go when buying software:

- Change your operation to match reasonably priced canned software
- OR
- Buy expensive custom software to match your operation.

A real "Catch 22" . . .

Unless you use our new Custom Software Pack!

This service gives you **custom software at canned prices!**

For example, a custom payroll program for only \$800.

Best of all, we offer the **only software guarantee** in the industry. Nobody, not IBM, Digital Research, . . . **nobody does that.**

This service is for CP/M systems only. Write for complete information. Our policy is to handle orders on a first come, first serve basis.

Circle 315 on Reader Service card.



COMPLEAT SYSTEMS

9551 Casaba Avenue
Chatsworth, CA 91311
(213) 993-1479

Check - Charge - Money Order

five numbers are then entered as DATA 112, 127, 73, 127, 112.

Column 1(16 +32 +64) = 112
 Column 2(1+2+4 +8 +16 +32 +64) = 127
 Column 3(1 +8 +64) = 73
 Column 4(1+2+4 +8 +16 +32 +64) = 127
 Column 5(16 +32 +64) = 112

Listing 1 shows the short program I needed to read the data and load it into the Base 2 printer. The program is simple, with the exception of special Base 2 LPrint commands as shown in line 8, which tells the printer to get ready to accept a new ASCII set. Lines 9-12 load the individual 96 ASCII characters and line 13 tells the printer to use the new ASCII set.

With this success under my belt, I then wanted to duplicate the original computer set, which is built into the Base 2 ROM. With this font available I could then change a few special characters for special one-time needs (i.e., † § ¶) and still use my regular word processor. This way I could replace a † for a # and use the # key for the special symbol †. Of course the bad news is that the screen would still show the #. Listing 2 contains the program and the data statements to duplicate the original character set in the Base 2. ■

Software for NorthStar Users

EXPENSE PROFILE \$29.95

Now a program that really helps at income tax time. It summarizes expenses by categories and by person. Makes SEPARATE vs JOINT TAX RETURN comparisons simple.

Promotes frequent review of spending habits. Guided by MENUS add new expenses, categories, and users anytime. Quickly search to any item to make changes. Store expenses on disk automatically.

DYNAMIC BUDGET \$29.95

Cope with rapidly changing economic conditions. Forecast effects of INFLATION on your family. CAL-NDAR built-in so recurring items like rent are entered only once.

Monthly listings of expenses, income, and balance. Change or add items anytime, data automatically stored on disk.

PATHFINDER DISASSEMBLER \$22.50

Z80 or 8080 code. Pauses at each jump or call to allow you to follow program or continue straight ahead. Printer & video output.

KID MATH \$17.50

Math drill. Watch speed, accuracy and confidence grow.

**CP/M versions
available soon**

First class postage paid in U.S. MD residents add 5% tax.

The Software Connection

10703 Meadowhill Rd.
Silver Spring, MD 20901

Circle 302 on Reader Service card. Dept KB

```

1 REM OHS MICRO COMPUTER SERVICES JULY 1981
2 REM BASE 2 REGULAR CHARACTER FONT GENERATION
3 DEFINT I,K,C:DIM CC(127,5)
4 FOR I=32TO 127:FOR K=1TO5:READ CC(I,K):NEXT K,I
5 LPRINTCHR$(C27);CHR$(C75);
6 FOR I=32TO127:FOR K=1TO5
7 I8=CC(I,K)+128
8 LPRINTCHR$(I8);
9 NEXT K,I
10 LPRINTCHR$(C27);:LPRINTCHR$(C76);
11 PRINT"FINISHED WITH LOADING REGULAR FONT"
31 REM REGULAR FONT DATA FOLLOWS
32 DATA 0.0.0.0.0
33 DATA 0.0.79.0.0
34 DATA 0.7.0.7.0
35 DATA 20.127.20.127.20
36 DATA 36.42.127.42.50
37 DATA 35.19.8.100.98
38 DATA 32.86.73.54.48
39 DATA 0.4.2.1.0
40 DATA 28.34.65.65.0
41 DATA 0.65.65.34.28
42 DATA 42.28.62.28.42
43 DATA 8.8.127.8.8
44 DATA 0.64.32.0.0
45 DATA 8.8.8.8.8
46 DATA 0.96.96.0.0
47 DATA 32.16.8.4.2
48 DATA 62.65.65.62.0
49 DATA 0.66.127.64.0
50 DATA 66.97.81.73.70
51 DATA 33.65.69.75.49
52 DATA 8.12.10.127.8
53 DATA 71.69.69.69.57
54 DATA 60.74.73.73.48
55 DATA 1.1.121.5.3
56 DATA 53.73.73.73.54
57 DATA 6.73.73.41.30
58 DATA 0.0.108.0.0
59 DATA 0.64.40.0.0
60 DATA 8.20.34.65.0
61 DATA 20.20.20.20.20
62 DATA 0.65.34.20.8
63 DATA 2.1.89.5.2
64 DATA 62.65.93.86.28
65 DATA 126.9.9.9.126
66 DATA 127.73.73.73.62
67 DATA 62.65.65.65.99
68 DATA 127.65.65.34.28
69 DATA 127.73.73.73.65
70 DATA 127.9.9.9.1
71 DATA 62.65.73.73.57
72 DATA 127.8.8.8.127
73 DATA 0.65.127.65.0
74 DATA 48.65.65.63.1
75 DATA 127.8.20.34.65
76 DATA 127.64.64.64.64
77 DATA 127.2.12.2.127
78 DATA 127.8.16.32.127
79 DATA 62.65.65.65.62
80 DATA 127.9.9.9.6
81 DATA 62.65.81.33.94
82 DATA 127.9.25.41.70
83 DATA 38.73.73.73.50
84 DATA 1.1.127.1.1
85 DATA 63.64.64.64.63
86 DATA 31.32.64.32.31
87 DATA 63.96.24.96.63
88 DATA 99.20.8.20.99
89 DATA 3.4.120.4.3
90 DATA 97.81.73.69.67
91 DATA 127.65.65.65.0
92 DATA 1.2.4.8.16
93 DATA 0.65.65.65.127
94 DATA 4.2.1.2.4
95 DATA 64.64.64.64.64
96 DATA 0.1.2.4.0
97 DATA 32.80.84.84.124
98 DATA 127.68.68.68.56
99 DATA 56.68.68.68.0
100 DATA 56.68.68.68.127
101 DATA 0.56.84.84.24
102 DATA 0.8.126.9.2
103 DATA 8.84.84.84.56
104 DATA 127.8.8.8.112
105 DATA 0.68.125.64.0
106 DATA 0.32.64.61.0
107 DATA 0.127.24.36.64
108 DATA 0.65.127.64.0
109 DATA 120.4.24.4.120
110 DATA 0.120.4.4.120
111 DATA 56.68.68.68.56
112 DATA 0.126.18.18.28
113 DATA 12.18.18.124.64
114 DATA 4.124.8.4.0
115 DATA 72.84.84.84.36
116 DATA 0.8.126.72.32
117 DATA 60.64.64.124.64
118 DATA 28.32.64.32.28
119 DATA 60.64.48.64.60
120 DATA 68.40.16.40.68
121 DATA 0.12.16.80.60
122 DATA 0.100.84.76.68
123 DATA 8.62.65.65.0
124 DATA 0.0.127.0.0
125 DATA 0.65.65.62.8
126 DATA 8.4.4.8.4
127 DATA 127.127.127.127.127

```

Listing 2. Microsoft program to duplicate original character set.

SPECIAL SALE!!

MOST ECONOMICAL SOURCE TO BUY FLOPPY DRIVES — FROM ONE OF THE LARGEST DEALERS IN THE WORLD! NOW YOU CAN BUY TANDON, QUME, TEAC, SHUGART, MPI, SIEMENS, REMEX, YANKEE, APPLE, EPSON, DEC, CDC, CIPHER, NEC, TALLY, ALTOS, ATARI, DATAPRODUCTS, IBM AND MORE . . .
... AT LOW COST!! IMMEDIATE SHIPPING!!

Add- on Drive for Apple II, 100% compatible (runs 3.2 & 3.3 DOS). Includes cable/cabinet ... \$339.00

5MB Tandon Winchester (TM602) & Controller/Cables/Software to run

DOS 3.3 for Apple II Computer **\$1795.00**
 Same system with **10MB Tandon Winchester** **1995.00**

IBM MEMORIES - 100% IBM Compatible Memories

64K	\$269.00	128K	\$499.00	192K	\$599.00	256K	699.00	512K	1299.00	Immediate Delivery
-----	----------	------	----------	------	----------	------	--------	------	---------	--------------------

QUME DISK DRIVES

DT-5 5¼" double sided, dual density drive, ANSI compatible, 500KB unformatted capacity, 48 TPI, 35 or 40 cylinders, 70 or 80 tracks **\$279.00**
DT-8 8" double sided, dual density, IBM compatible, 1.2MB/disk capacity (IBM format), 48 TPI, 77 cylinders, 154 tracks **479.00**

SHUGART

SA400 5¼" single/dual density, 250KB capacity, 48 TPI, 40 tracks, 1 head, 10 sectors/track **215.00**
SA450 5¼" single/dual density, 500KB capacity, 48 TPI, 40 tracks, 2 heads **269.00**
SA800/801 8" single/dual density, 800KB capacity, 48 TPI, 77 tracks, 1 R/W head, 32/16/8 sectors/track **379.00**
SA850/851 8" double sided, dual density floppy drive, 1.6 MB capacity, 48 TPI, 154 tracks, 32 sectors/track **535.00**

TEAC

FD50A Single sided, 5¼" floppy disk **199.00**
FD50B Double sided, 5¼" double density, floppy disk **299.00**
FD50E 80 tracks, 96 TPI, 5¼" floppy drive **299.00**
FD50F 160 tracks, 96 TPI, 5¼" double sided, floppy drive **399.00**

TANDON DISK DRIVES

TM100-1* 5¼" single sided, 250KB unformatted capacity, 48 TPI, 40 tracks **215.00**
TM100-2* 5¼" double sided, Northstar/Cromenco/TRS-80 compatible, 500KB unformatted capacity, 48 TPI, 80 tracks **279.00**
TM100-3* 5¼" single sided, 500KB unformatted capacity, 96/100 TPI, 80 tracks **279.00**
TM100-4* 5¼" double sided, Zenith/Heath/etc. compatible, 100KB unformatted capacity, 96/100 TPI, 160 tracks **399.00**
TM848-1 Thinline 8" drive, single sided, 8MB unformatted capacity, 48 TPI, 77 tracks **499.00**
TM848-2 Thinline 8" drive, double sided, 1.6MB unformatted capacity, 48 TPI, 154 tracks **549.00**
TM602 5MB Winchester drive, 6.4MB unformatted capacity, 254 TPI, 153 cylinders, 612 tracks, 2 platters, 4 recording heads, 3600 RPM **1025.00**
TM603 10MB Winchester drive, 9.5MB unformatted capacity, 254 TPI, 153 cylinders, 918 tracks, 3 platters, 6 heads **1170.00**
 *Disk Drives for IBM PC.

SPECIAL on S-100 Bus computer — YANKEE 800 S-100 Bus, Z-80 microprocessor, 4MHz crystal, complete turnkey computer \$2999.00

PDS-2300 16 bit computer, faster than any 16 bit machine, LSI 11/23 with CPU board 256KB memory, CRT terminal, DLV11-J board, power supply, two (2) 8" floppy drives with cabinet, complete turnkey system **8900.00**

PDS-300 LSI 11/23 memory, 256KB dual wide board **850.00**

PDS-400 PDP 11 memory, 256KB dual wide board **850.00**

ALL FLOPPY DRIVES & DEC MEMORIES REPAIRED AT LOW COST . . .
... AND QUICK TURNAROUND

FRANCHISE INQUIRIES WELCOME

Prices subject to change without notice.

PDS INC.

PERSONAL COMPUTERS
2630-H Walnut Ave.
Tustin, CA 92680

TOLL-FREE TELEPHONE NUMBERS
Outside California:

(800) 854-8428

Inside California:

(714) 730-7207

(408) 257-8413

RAM It on the Apple

The next time you're faced with putting untried code into an expensive PROM chip, try this simple solution.

By Joe Magee

If you like to tinker with your Apple computer as much as I like to tinker with mine, then by now you've designed at least one card to fit into the I/O slots. As you've found, the struc-

ture of the I/O is very flexible. The control lines and RAM space available are powerful features.

I recently designed an RS-232 interface for my Apple. I wanted it to

function in any slot, and I wanted it to take advantage of the random-access memory (RAM) space provided for each slot to hold its operational software.

If you're like me, you're reluctant to commit even one byte of untried software to an expensive programmable read-only memory (PROM) chip. Granted, the small amount of code required for an operational program to find what slot it is in is simple and reliable, but it may not always fit in each program exactly the same way.

So, I decided that I would need to develop the program in RAM, but not just any RAM—it had to be in the I/O address space. The Apple decodes the I/O RAM, but there is no RAM in the machine at those addresses. The answer was to put some there.

I could have put some on the card I was developing, but that seemed like a waste since a PROM socket was already there. I thought about building a small board, to plug into the PROM socket, that had RAM on it, but the card I was building did not have read/write logic going to the PROM socket. The answer turned out to be a separate card with nothing but RAM on it.

The schematic for the card is presented in Fig. 1. The card has 256 bytes of RAM, address decoding and slot selection. By plugging the card into any I/O slot (except slot 0) and setting the proper switch, the RAM on the card would appear to be in any

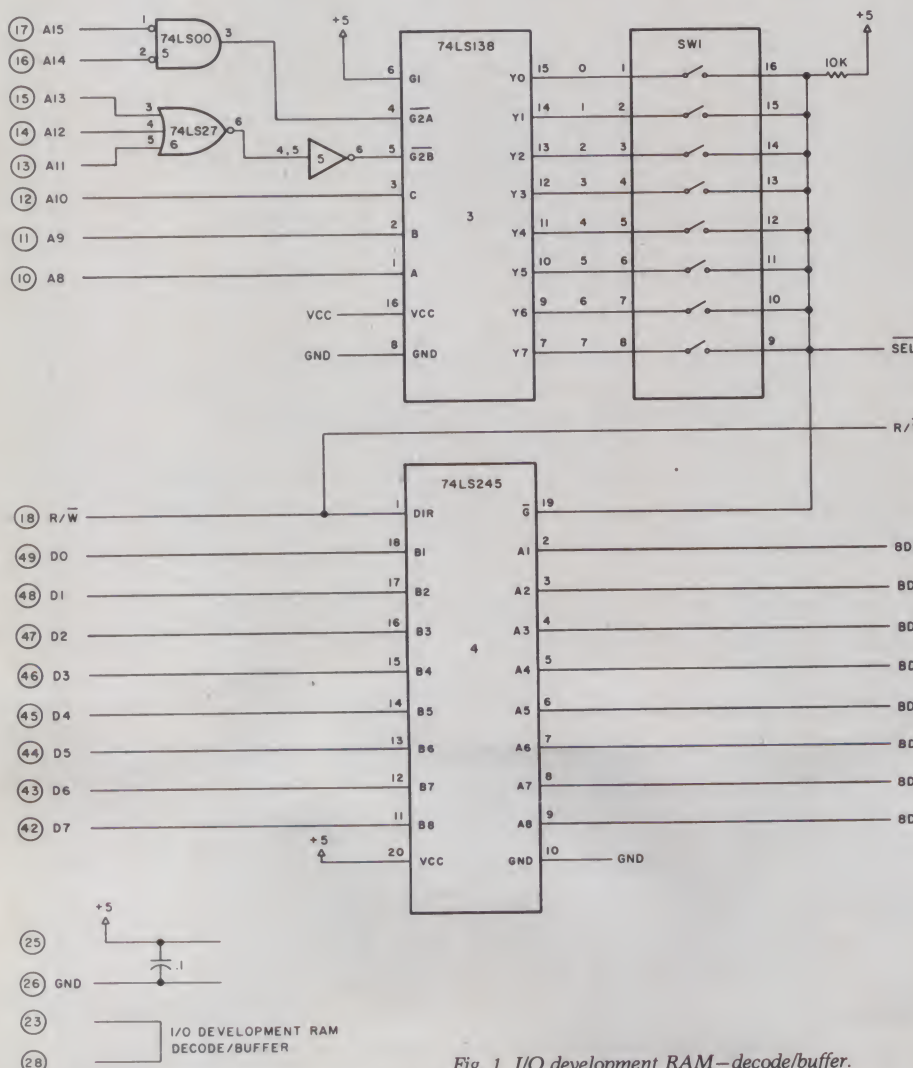


Fig. 1. I/O development RAM—decode/buffer.

Address correspondence to Joe Magee, 3928 Tacoma, Irving, TX 75062.

H & E COMPUTRONICS INC.

•• EVERYTHING FOR YOUR TRS-80™ • ATARI™ • APPLE™ • PET™ • CP/M™ • XEROX™ • IBM™ ••

* TRS-80 is a trademark of the Radio Shack Division of Tandy Corp. - * ATARI is a trademark of Atari Inc. - * APPLE is a trademark of Apple Corp. - * PET is a trademark of Commodore
* CP/M is a trademark of Digital Research - * XEROX is a trademark of Xerox Corp. - * IBM is a trademark of IBM Corp.



BUSINESS PAC 100

100 Ready-To-Run Business Programs

- ★ All orders processed within 24-Hours
- ★ 30-Day money back guarantee on all Software

(ON CASSETTE OR DISKETTE).....Includes 128 Page Users Manual.....

Inventory Control.....Payroll.....Bookkeeping System.....Stock Calculations.....

Checkbook Maintenance.....Accounts Receivable.....Accounts Payable.....

BUSINESS 100 PROGRAM LIST

NAME

DESCRIPTION

1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKVEN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEplete	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCKVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model
53 FQEOQSH	As above but with shortages permitted
54 FQEQQPB	As above but with quantity price breaks
55 FQEQECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAPI	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	HOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFDD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

- ☐ CASSETTE VERSION \$99.95
- ☐ DISKETTE VERSION \$99.95
- ☐ TRS-80* MODEL II VERSION \$149.95

ADD \$3.00 FOR SHIPPING IN UPS AREAS
ADD \$4.00 FOR C.O.D. OR NON-UPS AREAS
ADD \$5.00 TO CANADA AND MEXICO
ADD PROPER POSTAGE OUTSIDE OF U.S., CANADA AND MEXICO

COMPUTRONICS
MATHEMATICAL APPLICATIONS SERVICE™

50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977

ASK FOR OUR 64-PAGE CATALOG

*** ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE***

**NEW TOLL-FREE
ORDER LINE**
(OUTSIDE OF N.Y. STATE)
(800) 431-2818

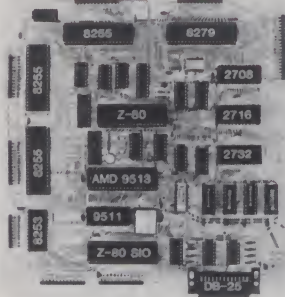


**24 HOUR
ORDER
LINE**
(914) 425-1535



Circle 6 on Reader Service card.

Z-80 SINGLE BOARD COMPUTER \$49.95



The MASTER CONTROLLER BOARD contains:

- Z-80 Microprocessor: will run 8080/8085 and Z-80 programs.
- 72-Parallel I/O lines; three 8255s
- Keyboard controller: 8279
- 12K-EPROM: three sockets for 2708, 2716, 2732
- 2K-RAM: 2114s
- 8-Sixteen bit counter timer channels: one 8253 and one AMD 9513
- 2-Serial I/O ports; one Z-80 SIO chip. One port has an RS-232 interface and connector.
- 1-High speed arithmetic processor: AMD 9511

All the I/O chips are memory mapped AND I/O mapped. A bus expansion connector is provided. Can be operated on 5 volts only.

All this on one board less than nine inches on a side

Only three LSI chips (Z-80, 8255, and EPROM) plus support gates and buffers are required for a working controller.

BARE BOARD \$49.95
With documentation.

MINIMUM KIT. Includes bare board with documentation, one each Z-80, 8255, 2716, four 2114's, 4Mhz crystal, and support gates and buffers, all socketed. \$119.95

MONITOR PROGRAM allows a CRT or TTY to control the MASTER CONTROLLER. This program requires the minimum kit and the serial parts kit. A programmed 2716 and listing is supplied with the monitor. \$29.95. Listing Only \$19.95

SERIAL PARTS. Includes 8253, Z-80 SIO, 1488, 1489, sockets, and DB-25 connector \$49.95

POWER SUPPLY. 5V2A, -5V $\frac{1}{4}$ A, +12V $\frac{1}{4}$ A, -12V $\frac{1}{4}$ A. \$44.95

ASSEMBLED and TESTED fully populated with monitor program less 9511. \$399.00

USA & CANADA include \$3.50 postage and handling. We ship World Wide please include 15% for shipping.

R.W. ELECTRONICS
3165 North Clybourn—M
Chicago, IL 60618
(312) 248-2480

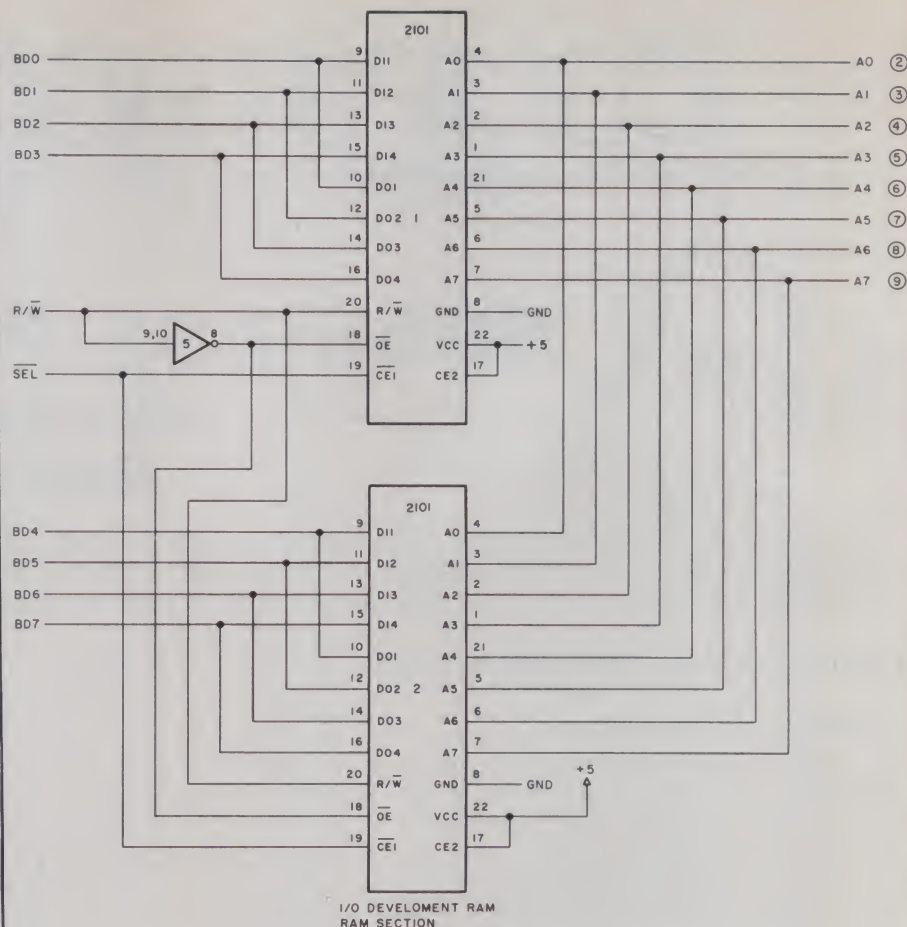


Fig. 2. I/O development RAM-RAM section.

desired slot. Thus, I could put my RS-232 card under development into any slot, the RAM card in any other slot, set the proper switch, and I now had RAM in the address space of the slot where the RS-232 card was. (Of course, I left the PROM socket empty during this time.)

Now I could develop the operational software without any concern for simulating slot-dependent considerations. The code that resulted would be already tested for all those problems, and the first time I blew the program into an expensive PROM, it should work the way I expected. And sure enough—it did.

How the RAM Card Works

The card is simple. It consists of the RAM, address decoding logic and bus transceiving logic.

ICs 1 and 2 are the RAM chips. They are 2101s, which are 256 by 4 bit static RAM chips. Two together give a 256-byte memory space, just what was needed.

ICs 3, 5 and 6 are the address decoding logic. The Apple I/O RAM is in 256-byte blocks starting at hexa-

decimal C100 and going through C7FF. The logic for the enable lines to IC3 is used to enable the 74LS138 only when the address lines A15 through A11 are in the binary state 11000. This enables the 74LS138 only between addresses C000 and C7FF, the I/O RAM address space. By connecting A8, A9 and A10 to the A, B and C inputs of IC3, one of the outputs would go low for each block of 256 bytes between C000 and C7FF. By routing all these lines through an eight-position DIP switch, any one line could be selected for the chip select line on the RAM chips. Thus, regardless of the slot the RAM card was in, the RAM could be selected as if it were in any desired slot.

The select line also goes to IC4, which is a 74LS245, an eight-bit bus transceiver. The select line and R/W lines together enable IC4 and select the direction of data. Thus, the RAM can either be written to or read from. The IC4 also serves to buffer the data bus.

Not very complex, but it sure beats putting almost the right code into an expensive PROM. ■

★ SOFTWARE ★ SUPPLIES ★

60
DAY
MONEY BACK
GUARANTEE**dBASE II****\$125⁰⁰ MERCHANDISE CREDIT****TOWARDS ANY FUTURE PURCHASE.****PLUS - FREE DIGITAL WATCH (69.⁰⁰ VALUE)
YOURS TO KEEP EVEN IF YOU RETURN YOUR dBASE II**

If your application calls for managing data, dBASE II may be the answer.

You can create a database and start entering data into it in less than a minute.

Type CREATE, then respond to the dBASE II prompts to name the file and define the fields in your records.

Once the record is defined, you can start entering data immediately, or add information later by typing APPEND. In both cases, dBASE presents you with an entire record structure for which you simply fill in some or all of the blanks.

Now, for a limited time only, you can purchase the most powerful DBMS system for your micro for the incredibly low price of \$95 delivered. We'll send you a copy of dBASE II, that you can run on your system, for 60 days. If you're not completely satisfied, then just send everything back and we'll return your money, no questions asked! Even if you go for another system, you'll be an informed buyer!! (dBASE II is a fine product by Ashton-Tate)

HEWLETT PACKARD FORMAT AVAILABLE**standard software
CORPORATION OF AMERICA**

10 MAZZEO DRIVE, RANDOLPH, MA 02368

(617) 963-7220**800-343-8420**LARGEST SELECTION
OF CPM SOFTWARE
IN THE U.S.A.MASTERCARD
AND
VISA ACCEPTED

CP/M is a Trademark of Digital Research

★ DISCOUNT PRICES ★ HARDWARE ★

★ SOFTWARE ★ SUPPLIES ★ DISCOUNT PRICES ★ HARDWARE ★

TEXAS COMPUTER SYSTEMS**We Offer Lowest Prices On****TRS-80****Model II 64k \$3248**

All accessories, disk expansions and software available at our low discount prices. Hard Disks in stock now! \$CALL

Model III 16k \$818**48k 2 Disk RS232c \$2049**

Ideal system for small business use. Has full RS warranty. Plus, for limited time, with your purchase, we are offering a FREE disk of utilities, games & business software valued at \$150. Call today for this special offer.

Color Computers**4k Level 1 \$308****16k Extended Basic \$459****16k Extended Basic****with TCS Memory \$439**

Other Color Computers & accessories at competitive prices. Disk Drives in stock. \$CALL

\$ CALL FOR PRICES \$

We offer a full line of Radio Shack computers and accessories, as well as TCS custom computers and software. Call now for our catalog and price list!

Epson Printers

The amazing EPSON printers with such standard features as 12 type fonts, removable print head, complete software control, word processor quality, TRS80 graphics, alternate character sets and parallel interface. All printers and interfaces in stock! If you buy elsewhere, you'll probably pay too much. Call for our low...low prices!!!

For fast, efficient service. Heart of we can air freight from Dallas

TEXAS COMPUTER SYSTEMS

P.O. Box 1327 Arlington, Texas 76004-1327

Toll Free Number 800 433-5184

Texas Residents 817 274-5625

• Payment Money order, cashiers check, certified check. Prices above reflect 3% cash discount. Call for VISA/MC prices

• Prices subject to change any time.
• No tax out-of-state. Texans add 5%.
• Many items shipped free. Call.**MICROCOMPUTING • BOOKS****ALL NEW FOR 80 OWNERS ENCYCLOPEDIA FOR THE TRS-80***

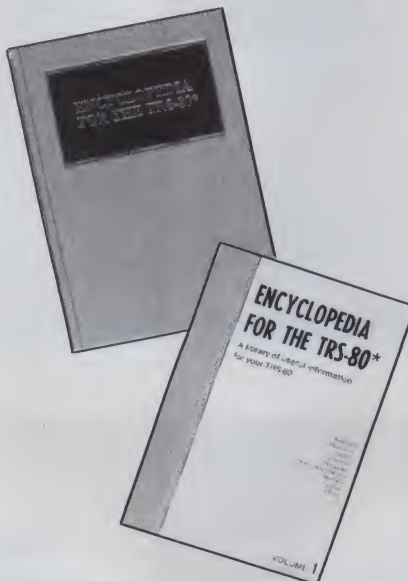
ENCYCLOPEDIA FOR THE TRS-80** is the newest peripheral for your microcomputer. This ten-volume reference series contains programs and articles especially selected to extend the documentation that comes with the TRS-80. Volumes of the Encyclopedia are being issued one-at-a-time, approximately six weeks apart. This means that each new volume will reflect the latest developments in TRS-80 microcomputing. Encyclopedia for the TRS-80 is available in two editions. The deluxe COLLECTOR'S EDITION has a handsome green and black hard cover with a dust jacket. A soft cover edition is also available.

To order single hard cover volumes of the Encyclopedia please specify:

Volume 1	EN8101	\$19.95*
Volume 2	EN8102	\$19.95*
Volume 3	EN8103	\$19.95*
Volume 4	EN8104	\$19.95*
Volume 5	EN8105	\$19.95*
Volume 6	EN8106	\$19.95*
Volume 7	EN8107	\$19.95*
Volume 8	EN8108	\$19.95*
Volume 9	EN8109	\$19.95*
Volume 10	EN8110	\$19.95*

To order single softcover volumes of the Encyclopedia please specify:

Volume 1	EN8081	\$10.95*
Volume 2	EN8082	\$10.95*
Volume 3	EN8083	\$10.95*
Volume 4	EN8084	\$10.95*
Volume 5	EN8085	\$10.95*
Volume 6	EN8086	\$10.95*
Volume 7	EN8087	\$10.95*
Volume 8	EN8088	\$10.95*
Volume 9	EN8089	\$10.95*
Volume 10	EN8090	\$10.95*



ENCYCLOPEDIA LOADER is the software companion to the Encyclopedia for the TRS-80. This special series of cassettes will allow you to load selected programs from the Encyclopedia instantly. Hours of keyboarding time and the aggravating search for typos is eliminated by using the Encyclopedia Loader.

Encyclopedia Loader for Volume 1 of the Encyclopedia of the TRS-80 is available at a Special Introductory Price of \$12.95 (a \$14.95 value). To take advantage of this offer specify:

EL800111 \$12.95*

Additional Encyclopedia Loaders will be available as each volume of the Encyclopedia for the TRS-80 is issued. To order specify Encyclopedia Loader:

Volume 2	EL8002	\$14.95*
Volume 3	EL8003	\$14.95*
Volume 4	EL8004	\$14.95*
Volume 5	EL8005	\$14.95*
Volume 6	EL8006	\$14.95*
Volume 7	EL8007	\$14.95*
Volume 8	EL8008	\$14.95*
Volume 9	EL8009	\$14.95*
Volume 10	EL8010	\$14.95*

SPECIAL OFFER**All 10 Volumes of ENCYCLOPEDIA LOADER™****A \$149.50 value for only \$119.97****EL8000 \$119.97****(shipping included)**

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.50 for first book, \$1.00 each additional book, \$10.00 per book foreign airmail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at this address.

*TRS-80 and TRSDOS are trademarks of the Radio Shack Division of Tandy Corporation.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

Special Interests



A USER GUIDE TO THE UNIX SYSTEM by Jean Yates and Rebecca Thomas. Here at last is a clearly written book that allows you to use the Unix operating system easily, and at a fraction of the time it previously took. If you're using, evaluating or simply curious about this system, this is your book. BK1242 \$15.99

WORDSTAR MADE EASY by Walter A. Ettlin. Now WordStar is as simple to learn as it is easy to use. This book teaches WordStar in 14 easy lessons, saving hours of hard work, it comes with a convenient pull-out Command Card. BK1239 \$7.95

INTRODUCTION TO WORD PROCESSING by Hal Glatzer. This book explains in plain language what a word processor can do, how to use one, how it improves productivity—especially in businesses that handle lots of words—and how to buy one wisely. No technical knowledge required, for all first-time users and those considering purchasing a word processor. BK1238 \$12.95

THE CUSTOM TRS-80 AND OTHER MYSTERIES—by Dennis Kitz. More than 300 pages of TRS-80 customizing information. With this book you'll be able to explore your computer like never before. Want to turn an 8 track into a mass storage unit? Individual reverse characters? Replace the BASIC ROMs? Make Music? High speed, reverse video, Level I and Level II? Fix it if it breaks down? All this and much, much more. Even if you have never used a soldering iron or read a circuit diagram, this book will teach you how! This is the definitive guide to customizing your 80! BK1218 \$29.95.*

BASIC FASTER AND BETTER AND OTHER MYSTERIES—by Lewis Rosenfelder. You don't have to learn assembly language to make your programs run fast. With the dozens of programming tricks and techniques in this book you can sort at high speed, swap screens in the twinkling of an eye, write INKEY routines that people think are in assembly language and add your own commands to BASIC. Find out how to write elegant code that makes your BASIC really hum, and explore the power of USR calls. BK1221 \$29.95.*

THE CP/M HANDBOOK (with MP/M)—by Rodney Zaks. A complete guide and reference handbook for CP/M—the industry standard in operating systems. Step-by-step instruction for everything from turning on the system and inserting the diskette to correct user discipline and remedial action for problem situations. This also includes a complete discussion of all versions of CP/M up to and including 2.2, MP/M and CDOS. BK1187 \$14.95.*

TRS-80 DISK AND OTHER MYSTERIES—by Harvard C. Pennington. This is the definitive work on the TRS-80 disk system. It is full of detailed "How to use," information with examples, samples and in-depth explanations suitable for beginners and professionals alike. The recovery of one lost file is worth the price alone. BK1181 \$22.50.*

MICROSOFT BASIC DECODED AND OTHER MYSTERIES—by James Farvour. From the company that brought you TRS-80 DISK AND OTHER MYSTERIES. Contains more than 6500 lines of comments for the disassembled Level II ROMs and six additional chapters describing every BASIC subroutine, with assembly language routines showing how to use them. Flowcharts for all major routines give the reader a real insight into how the interpreter works. BK1186 \$29.50.*

NEW NEW

Introductory



KILOBAUD CLASSROOM—by George Young and Peter Stark. Learning electronics theory without practice isn't easy. And it's no fun to build an electronics project that you can't use. *Kilobaud Classroom* the popular series first published in *Kilobaud Microcomputing*, combines theory with practice. This is a practical course in digital electronics. It starts out with very simple electronics projects, and by the end of the course you'll construct your own working microcomputer!

Authors Young and Stark are experienced teachers, and their approach is simple and direct. Whether you're learning at home or in the classroom, this book provides you with a solid background in electronics—and you'll own a computer that you built yourself! BK7386 \$14.95

TOOLS & TECHNIQUES FOR ELECTRONICS—by A. A. Wicks. An easy-to-understand book written for the beginning kit-builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects, as well as specialized metal-working tools and the chemical aids which are used in repair shops. BK7348 \$4.95.*

MICROCOMPUTER DATA COMMUNICATIONS SYSTEMS by Frank J. Derfler. This text has a lot of good information on message systems and information utilities; the fundamentals of data communications, modems, terminals, and software for specific microcomputers. Interesting and informative for the beginner, yet a good reference for the experienced data communications user. BK1243 \$12.95

UNDERSTANDING AND PROGRAMMING MICROCOMPUTERS—A valuable addition to your computing library. This two part text includes the best articles that have appeared in 73 and *Kilobaud Microcomputing* magazines on the hardware and software aspects of microcomputing. Well known authors and well structured text helps the reader get involved. BK7382 \$10.95.*

SOME OF THE BEST FROM KILOBAUD/MICROCOMPUTING—A collection of the best articles that have recently appeared in *Kilobaud/MICROCOMPUTING*. Included is material on the TRS-80 and PET systems, CP/M, the 8080/8085/Z80 chips, the ASR-33 terminal. Data base management, word processing, text editors and file structures are covered too. Programming techniques and hardware construction projects for modems, high speed cassette interfaces and TVTs are also included in this large format, 200 plus page edition. BK7311 \$10.95.*

DON'T (or How to Care for Your Computer)—by Rodney Zaks. In plain language, with numerous illustrations, this book tells all the do's and don't's of the care, preservation and correct operation of the small computer system. Specific chapters cover each piece of hardware and software, as well as safety and security precautions and help for problem situations. Have your computer work right the first time and keep it working. No technical background required. For all computer users. BK1237 \$11.95.

YOUR FIRST COMPUTER—by Rodney Zaks. Whether you are using a computer, thinking about using one or considering purchasing one, this book is indispensable. It explains what a computer system is, what it can do, how it works and how to select various components and peripheral units. It is written in everyday language and contains invaluable information for the novice and the experienced programmer. (The first edition of this book was published under the title "An Introduction to Personal and Business Computing") BK1191 \$8.95.*

MICROPROCESSOR INTERFACING TECHNIQUES—by Austin Lesca & Rodney Zaks—will teach you how to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or S-100. BK1037 \$17.95.*

The NEW HOBBY COMPUTERS



AN INTRODUCTION TO MICROCOMPUTERS, VOL. 1—2nd Edition completely revised. Dedicated to the basic concepts of microcomputers and hardware theory. The purpose of Volume I is to give you a thorough understanding of what microcomputers are. From basic concepts (which are covered in detail), Volume I builds the necessary components of a microcomputer system. This book highlights the difference between minicomputers and microcomputers. BK1030 \$12.99.*

THE NEW HOBBY COMPUTERS—This book takes it from where *Hobby Computers Are Here!* leaves off, with chapters on Large-Scale Integration, how to choose a microprocessor chip, an introduction to programming, low-cost I/O for a computer, computer arithmetic, checking memory boards... and much, much more! Don't miss this tremendous value! BK7340 Only \$4.95.*

AN INTRODUCTION TO MICROCOMPUTERS, VOL. 0—The Beginner's Book—Written for readers who know nothing about computers—for those who have an interest in how to use computers—and for everyone else who must live with computers and should know a little about them. The first in a series of 4 volumes, this book will explain how computers work and what they can do. Computers have become an integral part of life and society. During any given day you are affected by computers, so start learning more about them with Volume 0. BK1130 \$7.95.*

HOBBY COMPUTERS ARE HERE!—If you want to come up to speed on how computers work—hardware and software—this is an excellent book. It starts with fundamentals and explains the circuits and the basics of programming, along with a couple of TVT construction projects, ASCII, Baudot, etc. This book has the highest recommendations as a teaching aid. BK7322 \$4.95.*

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to *Microcomputing* Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.50 for first book, \$1.00 each additional book, \$10.00 per book foreign air-mail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at this address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

Basic & Pascal

INTRODUCTION TO TRS-80 LEVEL II BASIC AND COMPUTER PROGRAMMING—by Michael P. Zabin-ski. Written by an experienced educator, this is the book for those beginners who want to learn about computers without having to become an expert. It has practical programs, useful line-by-line comments, excellent flowcharts accompanied by line numbers and over 200 exercises which help the reader assess progress, reinforce comprehension, and provide valuable practical experience. BK1219 \$10.95.*

LEARNING TRS-80 BASIC—by David A. Lien. Dr. Lien, who is the author of *THE BASIC HANDBOOK* and the original Radio Shack *LEVEL I USER'S MANUAL*, has compiled a tutorial which includes portions of the original *USER'S MANUAL*, and most of *LEARNING LEVEL II* along with extensive additions. It will completely cover the TRS-80 Models I, II, III, and 16 (sorry, not the color or pocket computers). It is, of course, written in the easy learning style which readers of Dr. Lien's books have come to enjoy. BK1175 \$19.95.

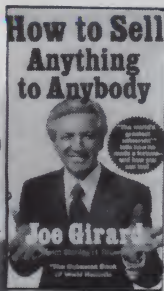
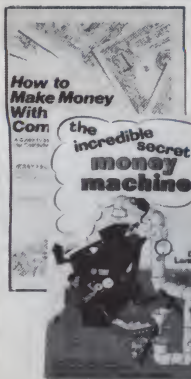
THE BASIC HANDBOOK—SECOND EDITION—by David Lien. This book is unique. It is a virtual *ENCYCLOPEDIA OF BASIC*. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the *HANDBOOK* comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. BK1174 \$19.95.*

BASIC BASIC (2ND EDITION)—by James S. Coan. This is a textbook which incorporates the learning of computer programming using the BASIC language with the teaching of mathematics. Over 100 sample programs illustrate the techniques of the BASIC language and every section is followed by practical problems. This second edition covers character string handling and the use of data files. BK1026 \$10.50.*

ADVANCED BASIC—Applications including strings and files, coordinate geometry, area, sequences and series, simulation and graphing and games. BK1000 \$10.75.*

INTRODUCTION TO PASCAL—by Rodney Zaks. A step-by-step introduction for anyone wanting to learn the language quickly and completely. Each concept is explained simply and in a logical order. All features of the language are presented in a clear, easy-to-understand format with exercises to test the reader at the end of each chapter. It describes both standard PASCAL and UCSD PASCAL—the most widely used dialect for small computers. No computer or programming experience is necessary. BK1189 \$14.95.*

PROGRAMMING IN PASCAL—by Peter Grogono. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming, which has been defined by Edsger Dijkstra and C.A.R. Hoare. As such, it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich; it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. It does not assume knowledge of any other programming language and therefore suitable for an introductory course. BK1140 \$12.95.*



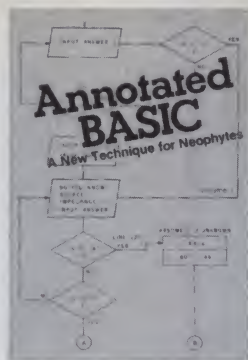
Money making

HOW TO MAKE MONEY WITH COMPUTERS—In 10 information-packed chapters, Jerry Felsen describes more than 30 computer-related, money-making, high profit, low capital investment opportunities. BK1003 \$15.00.*

HOW TO SELL ANYTHING TO ANYBODY—According to *The Guinness Book of World Records*, the author, Joe Girard, is "the world's greatest salesman." This book reveals how he made a fortune—and how you can, too. BK7306 \$2.25.*

THE INCREDIBLE SECRET MONEY MACHINE—by Don Lancaster. A different kind of "cookbook" from Don Lancaster. Want to slash taxes? Get free vacations? Win at investments? Make money from something that you like to do? You'll find this book essential to give you the key insider details of what is really involved in starting up your own money machine. BK1178 \$5.95.*

PRICES SUBJECT TO CHANGE WITHOUT NOTICE



NEW

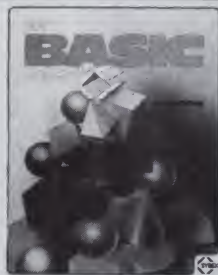
NEW

ANNOTATED BASIC—A NEW TECHNIQUE FOR NEOPHYTES—BASIC programming was supposed to be simple—a beginner's programming language which was so near to English that it could be easily understood. But, in recent years, BASIC has become much more powerful and therefore much more difficult to read and understand. BASIC simply isn't basic anymore.

Annotated BASIC explains the complexities of modern BASIC. It includes complete TRS-80[®] Level II BASIC programs that you can use. Each program is annotated to explain in step-by-step fashion the workings of the program. Programs are flowcharted to assist you in following the operational sequence. And—each chapter includes a description of the new concepts which have been introduced.

Annotated BASIC deals with the hows and whys of TRS-80 BASIC programming. How is a program put together? Why is it written that way? By observing the programs and following the annotation, you can develop new techniques to use in your own programs—or modify commercial programs for your specific use.

Annotated BASIC Volume 1 BK7384 \$10.95
Annotated BASIC Volume 2 BK7385 \$10.95
Order Both Volumes and Save! BK738402 \$18.95



50 BASIC EXERCISES—by J. P. Lamoitier. This book is structured around the idea that the best way to learn a language is through actual practice. It contains 50 completely explained exercises: statement and analysis of the problem, flowcharts, programs and actual runs. Program subjects include mathematics, business, games, and operations research, and are presented in varying levels of difficulty. This format enables anyone to learn BASIC rapidly, checking their progress at each step. BK1192 \$12.95.*

Business

THEORY Z—How American Business Can Meet the Japanese Challenge—by William Ouchi. Why are the Japanese catching up and surpassing American industrial productivity? What allows Japanese industrialists to offer guaranteed lifetime employment to their workforce? This book will help you understand the Theory Z managerial philosophy and its implications for the American corporate future. Examples are given of the American industrial giants already operating under Z-style management, and the impact of this style on the quality of their executives and workers is explored. A must for the alert businessman, large or small. BK1226 \$12.95*

SO YOU ARE THINKING ABOUT A SMALL BUSINESS COMPUTER—by Richard G. Canning and Nancy C. Leeper. For a well-organized manual on the process of selecting the right computer system for your small business, this text can't be excelled. Designed to introduce the novice in data and word processing to the real benefits of computerization, the book is filled with money- and time-saving tips, photos of equipment, lists of suppliers, prices, explanations of computer terminology, and helpful references to additional sources of information. Everyone contemplating a first computer installation should have this book. BK1222 \$14.00*

PAYROLL WITH COST ACCOUNTING—IN BASIC—by L. Poole & M. Borchers, includes program listings with remarks, descriptions, discussions of the principle behind each program, file layouts, and a complete user's manual with step-by-step instructions, flowcharts, and simple reports and CRT displays. Payroll and cost accounting features include separate payrolls for up to 10 companies, time-tested interactive data entry, easy correction of data entry errors, job costing (labor of distribution), check printing with full deduction and pay detail, and 16 different printed reports, including W-2 and 941 (in CBASIC). BK1001 \$20.00.*

SOME COMMON BASIC PROGRAMS—Published by Adam Osborne & Associates, Inc. Perfect for non-technical computerists requiring ready-to-use programs. Business programs, plus miscellaneous programs. Invaluable for the user who is not an experienced programmer. All will operate in the stand-alone mode. BK1053 \$14.99

PIMS: PERSONAL INFORMATION MANAGEMENT SYSTEM—Learn how to unleash the power of a personal computer for your own benefit in this ready-to-use data-base management program. BK1009 \$11.95.*



GAMES

40 COMPUTER GAMES FROM KILOBAUD MICROCOMPUTING—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. BK7381 \$7.95.*

BASIC COMPUTER GAMES—Okay, so once you get your computer and are running in BASIC, then what? Then you need some programs in BASIC, that's what. This book has 101 games for you from very simple to real buggers. You get the games, a description of the games, the listing to put in your computer and a sample run to show you how they work. Fun. Any one game will be worth more than the price of the book for the fun you and your family will have with it. BK1074 \$7.50.*

MORE BASIC COMPUTER GAMES—Edited by David H. Ahl. More fun in BASIC! 84 new games from the people who brought you *BASIC Computer Games*. Includes such favorites as Minotaur (battle the mythical beast) and Eliza (unload your troubles on the doctor at bargain rates). Complete with game description, listing and sample run. BK1182 \$7.50.*

WHAT TO DO AFTER YOU HIT RETURN—PCC's first book of computer games... 48 different computer games you can play in BASIC... programs, descriptions and many illustrations. Lunar Landing, Hamurabi, King, Civel 2, Qubic 5, Taxman, Star Trek, Crash, Market, etc. BK1071 \$16.50.*

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.50 for first book, \$1.00 each additional book, \$10.00 per book foreign air-mail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at this address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

Microcomputing, July 1982 113

MICROCOMPUTING BOOKS

Programming

MICROCOMPUTING BOOKS



Z-80

TRS-80 ASSEMBLY LANGUAGE—by Hubert S. Howe, Jr. This book incorporates into a single volume all the pertinent facts and information you need to know to program and enjoy the TRS-80. Included are clear presentations of all introductory concepts, completely tested practical programs and subroutines, details of ROM and RAM and disk operating systems, plus comprehensive tables, charts and appendices. Suitable for the first time user or more experienced users. BK1217 \$9.95.*

INSIDE LEVEL II—For machine language programmers. This is a comprehensive reference guide to the Level II ROMs, allowing easy utilization of the sophisticated routines they contain. It concisely explains set-ups, calling sequences, variable passage and I/O routines. Part II presents an entirely new composite program structure which unloads under the SYSTEM command and executes in both BASIC and machine code with the speed and efficiency of a compiler. Special consideration is given to disk systems. BK1183 \$15.95.*

PROGRAMMING THE Z-80—by Rodney Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text and a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. BK1122 \$15.95.*

Z-80 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book thoroughly covers the Z-80 instruction set, abounding in simple programming examples illustrating software development concepts and actual assembly language usage. Features include Z-80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. BK1177 \$16.99.*

PROGRAMMING THE 6502 (Third Edition)—Rodnay Zaks has designed a self-contained text to learn programming, using the 6502. It can be used by a person who has never programmed before, and should be of value to anyone using the 6502. The many exercises will allow you to test yourself and practice the concepts presented. \$13.95.* BK1005

6502 APPLICATIONS BOOK—Rodnay Zaks presents practical-application techniques for the 6502 microprocessor, assuming an elementary knowledge of microprocessor programming. You will build and design your own domestic-use systems and peripherals. Self-test exercises included. BK1006 \$12.95.*

Cook Books



CMOS COOKBOOK—by Don Lancaster. Details the application of CMOS, the low power logic family suitable for most applications presently dominated by TTL. Required reading for every serious digital experimenter! BK1011 \$10.50.*

TTL COOKBOOK—by Don Lancaster. Explains what TTL is, how it works, and how to use it. Discusses practical applications, such as a digital counter and display system, events counter, electronic stopwatch, digital voltmeter and a digital tachometer. BK1063 \$9.50.*

TVT COOKBOOK—by Don Lancaster. Describes the use of a standard television receiver as a microprocessor CRT terminal. Explains and describes character generation, cursor control and interface information in typical, easy-to-understand Lancaster style. BK1064 \$9.95.*

NANOS SYSTEM REFERENCE

CARDS FOR APPLE II, APPLE II

PLUS, MODELS I, II, III and COLOR COMPUTER

At last! No more flipping through the pages of the Basic manual! No more working through the maze of machine language instructions! These cards



completely summarize the Basic and Assembler manuals! **FEATURES INCLUDE:** memory map, eyeball graphics, math instructions, basic commands, store instructions, basic functions, load instructions, basic statements, move instructions, special keys, exchange instructions, print using examples, shift instructions, basic special characters, compare instructions, basic and assembler messages and codes, branch instructions, basic facts, data alteration instructions, reserved words, I/O instructions, ROM routines, complete character chart with graphics and space-compression codes, hex-dec chart, control code cross-reference, assembler instructions commands and operators, screen line layout, editor commands & subcommands, condition code easy access. Designed as a fold-up, accordion-style card, fits in your pocket. Panels organized for optimum speed for reference.

Model I: BASIC only FC1001 \$2.95
Model I: BASIC and Assembler FC1002 \$4.95
Model II: BASIC and Assembler FC1005 \$5.95
Model III: BASIC only FC1004 \$3.95
Model III: BASIC and Assembler FC1003 \$5.95
APPLE II: BASIC only FC1007 \$3.95
APPLE II: BASIC + 6502 FC1008 \$4.95

6502

68000/6809

PET/CBM PERSONAL COMPUTER GUIDE—by Adam Osborne and Carol Donahue. **REVISED SECOND EDITION** This is the book that will show you what the Commodore PET or CBM can do and how to get your's up and running. Designed as a self-teaching BASIC tutorial, the book will teach you both BASIC and CBM BASIC, yet it assumes no knowledge of computers or programming. Included are: complete operating instructions, Description of all PET/CBM BASIC statements, optimal programming techniques and solutions to many programming problems. BK1231 \$15.00

SOME COMMON BASIC PROGRAMS, APPLE II EDITION—by Lon Poole et al. A powerful collection of financial, statistical, home management and mathematics programs—76 in all—Each program is presented with BASIC source code, operating instructions and descriptions. If you're a beginning programmer you can learn from this book what well designed and documented programs look like. BK1232 \$14.95

UNDERSTANDING YOUR VIC VOL. 1: BASIC PROGRAMMING—by David Schultz. For the beginning VIC programmer—this book is full of examples and exercises (with expected results included as immediate feedback) that will help you to quickly and easily learn about the VIC. Included are chapters on program design with the use of pseudo code and data dictionaries to refine programming problems, and on VIC color and sound features. A fine learn-by-doing programming guide. BK1234 \$11.95.

6502 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book provides comprehensive coverage of the 6502 microprocessor assembly language. Leventhal covers over 80 programming examples from simple memory load loops to complete design projects. Features include 6502 assembler conventions, input/output devices and interfacing methods and programming the 6502 interrupt system. BK1176 \$16.99.*

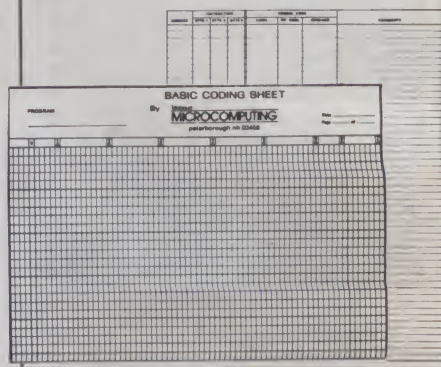
THE APPLE II USER'S GUIDE—by Lon Poole, Martin McNiff, and Steven Cook. This guide is the key to unlocking the full power of your Apple II or Apple II Plus. Topics include: "Applesoft and Integer BASIC Programming"—especially how to make the best use of Apple's sound, color and graphics capabilities; "Machine Level Programming," "Hardware Features," which covers the disk drive and printer, and "Advanced Programming"—describing high resolution graphics techniques and other advanced applications. Well organized and easy to use. BK1220 \$15.00.*

6809 MICROCOMPUTER PROGRAMMING AND INTERFACING—by Andrew C. Staugaard, Jr. Getting involved with Tandy's new Color Computer? If so, this new book from the Blacksburg Group will allow you to exploit the awesome power of the machine's 6809 microprocessor. Detailed information on processor architecture, addressing modes, register operation, data movement, arithmetic logic operations, I/O and interfacing is provided, as well as a review section at the end of each chapter. Four appendices are included covering the 6809 instruction set, specification sheets of the 6809 family of processors, other 6800 series equipment and the 6809/6821 Peripheral Interface Adapter. This book is a must for the serious Color Computer owner. BK1215 \$13.95.*

68000 MICROPROCESSOR HANDBOOK—by Gerry Kane. Whether you're currently using the 68000, planning to use it, or simply curious about one of the newest and most powerful microprocessors, this handbook has all the answers. A clear presentation of signal conversions, timing diagram conventions, functional logic, three different instruction set tables, exception processing, and family support devices provides more information about the 68000 than the manufacturer's data sheets. A stand alone reference book which can also be used as a supplement to *An Introduction to Microcomputers: Vol. 2—Some Real Microprocessors*. BK1216 \$6.99.*

68000 ASSEMBLY LANGUAGE PROGRAMMING—by Gerry Kane, et al. A straightforward self teaching text book on assembly language programming for the 68000 microprocessor. This book contains the entire instruction set, describes the function of assemblers and assembly instructions and discusses basic software development concepts. A large number of practical programming examples are included. BK1233 \$16.99

MICROCOMPUTING CODING SHEETS Microcomputing's dozen or so programmers wouldn't try to work without these handy scratch pads, which help prevent the little errors that can cost hours and hours of programming time. Available for programming in Assembly/Machine Language (PD1001), which has columns for address, instruction (3 bytes), source code (label, op code, operand) and comments; and for BASIC (PD1002) which is 72 columns wide. 50 sheets to a pad. \$23.99.*



PRICES SUBJECT TO CHANGE WITHOUT NOTICE

*Use the order card in this magazine or itemize your order on a separate piece of paper and mail to Microcomputing Book Department • Peterborough NH 03458. Be sure to include check or detailed credit card information. No C.O.D. orders accepted. All orders add \$1.50 for first book, \$1.00 each additional book. \$10.00 per book foreign air-mail. Please allow 4-6 weeks for delivery. Questions regarding your order? Please write to Customer Service at this address.

FOR TOLL FREE ORDERING CALL 1-800-258-5473

FOR ONLY \$129.95 Learn Computing

From The Ground Up

Build a Computer kit that grows with you, and can expand to 64k RAM, Microsoft BASIC, Text Editor/Assembler, Word Processor, Floppy Disks and more.

EXPLORER/85

Here's the low cost way to learn the fundamentals of computing, the all-important basics you'll need more and more as you advance in computer skills. For just \$129.95 you get the advanced design Explorer/85 motherboard, with all the features you need to learn how to write and use programs. And it can grow into a system that is a match for any personal computer on the market. Look at these features: 8085 Central Processing Unit, the microprocessor "heart" of the Explorer/85. (Join the millions who will buy and use the 8080/8085 this year alone.) Four 8-bit plus one 6-bit input/output ports from which you can input and output your programs, as well as control external switches, relays, lights, etc. A cassette interface that lets you store and reload programs you've learned to write. A deluxe 2,000 byte operating system/monitor makes it easy to learn computing in several important ways. It allows simpler, faster writing and entering of programs. It permits access by you to all parts of the system so you can check on the status of any point in the program. It allows tracing each program step by step, with provision for displaying all the contents of the CPU (registers, flags, etc.) and it does much more.

You get all this in the starting level (Level A) of the Explorer/85 for only \$129.95. Incredible! To use, just plug in your 8VDC power supply and terminal or keyboard/display — if you don't have them, see our special offers below.

Level A Computer kit (Terminal Version) ... \$129.95 plus \$3 P&I.*
Level A kit (Hex Keypad/Display Version) ... \$129.95 plus \$3 P&I.*

LEVEL B — This "building block" converts the motherboard into a two-slot S100 bus (industry standard) computer. Now you can plug in any of the hundreds of S100 cards available.

Level B kit ... \$49.95 plus \$2 P&I.*
S100 bus connectors (two required) ... \$4.85 each, postpaid.

LEVEL C — Add still more computing power: this "building block" mounts directly on the motherboard and expands the S100 bus to six slots.
Level C kit ... \$39.95 plus \$2 P&I.*

S100 bus connectors (five required) ... \$4.85 each, postpaid.

LEVEL D — When you reach the point in learning that requires more memory, we offer two choices: either add 4k of a memory directly on the motherboard, or add 16k of 64k of memory by means of a single S100 card, our famous "JAWS".

Level D kit (CHECK ONE):
4k on-board ... \$49.95 plus \$2 P&I.*
16k S100 "JAWS" ... \$149.95 plus \$2 P&I.*
32k S100 "JAWS" ... \$199.95 plus \$2 P&I.*
64k S100 "JAWS" ... \$249.95 plus \$2 P&I.*
128k S100 "JAWS" ... \$299.95 plus \$2 P&I.*

LEVEL E — An important "building block," it activates the 8k ROM/EPROM space on the motherboard. Now just plug in our 8k Microsoft BASIC or your own custom programs.

Level E kit ... \$5.95 plus 50¢ P&I.*

Microsoft BASIC — It's the language that allows you to talk English to your computer. It is available in three versions:
8k cassette version of Microsoft BASIC (requires Level B and 12k of RAM minimum; we suggest a 16k S100 "JAWS" — see above) ... \$64.95 postpaid.
8k ROM version of Microsoft BASIC (requires Level B and 16k of RAM; just plug into your Level E sockets. We suggest either the 4k Level D RAM expansion or a 16k S100 "JAWS" ...) ... \$69.95 plus \$2 P&I.*
Disk version of Microsoft BASIC (requires Level B, 32k of RAM, floppy disk controller, 8" floppy disk drive) ... \$325 postpaid.

TEXT EDITOR/ASSEMBLER — The editor/assembler is a software tool (a program) designed to simplify the task of writing programs. As your programs become longer and more complex, the assembler can save you many hours of programming time. This software includes an editor program that enters the programs you write, makes changes, and saves the programs on cassettes. The assembler performs the clerical task of translating symbolic code into the computer-readable object code. The editor/assembler program is available either in cassette or a ROM version.

Editor/Assembler (Cassette version: requires Level B and 8k (min.) of RAM; we suggest 16k "JAWS" — see above) ... \$64.95 plus \$2 P&I.*
Editor/Assembler (ROM version: supplied on an S100 card; requires Level B and 4k RAM (min.) — we suggest either Level D or 16k "JAWS") ... \$69.95 plus \$2 P&I.*

8" FLOPPY DISK — A remarkable "building block." Add our 8" floppy disk when you need faster operation: more convenient program storage; perhaps a business application, and access to the literally thousands of programs and program languages available today. You simply plug them into your Explorer/85 disk system — it accepts all IBM-formatted CP/M programs.

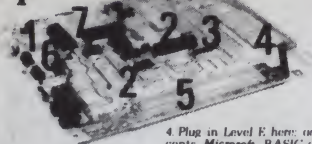
8" Floppy Disk Drive ... \$499.95 plus \$12 P&I.*
Floppy Controller Card ... \$109.95 plus \$2 P&I.*
Disk Drive Cabinet & Power Supply ... \$89.95 plus \$3 P&I.*
Drive Cables (set up for two drives) ... \$25.00 plus \$1.50 P&I.*

CP/M 2.2 Disk Operating System, includes Text Editor/Assembler, dynamic debugger, and other features that give your Explorer/85 access to thousands of existing CP/M-based programs ... \$150.00 postpaid.

NEED A POWER SUPPLY? Consider our AP-1. It can supply all the power you need for a fully expanded Explorer/85 (note: disk drives have their own power supply). Plus the AP-1 fits neatly into the attractive Explorer steel cabinet (see below).

AP-1 Power Supply kit (8V @ 5 amps) in deluxe steel cabinet ... \$39.95 plus \$2 P&I.*

NEED A TERMINAL? We offer you choices: the least expensive one is our Hex Keypad/Display kit that displays the information on a calculator-type screen. The other choice is our ASCII Keyboard/Computer Terminal kit, that can be used with either



1. Plug in Netronic's Hex Keypad/Display
2. Add Level B to convert to 64k RAM
3. Add two S100 boards
4. Plug in Level E here: or, copy Microsoft BASIC or Editor/Assembler in ROM
5. Add two S100 boards
6. Add your own custom circuits (prototyping and)
7. Connect terminal

a CRT monitor or a TV set (if you have an RF modulator)
Hex Keypad/Display kit ... \$69.95 plus \$2 P&I.*

FASTERM-64 TERMINAL KIT — Featuring a 56 key ASCII keyboard, 128 character set upper and lower case, 75 ohm output, 8 baud rates, 150 to 19,200 (switch select, able), RS232C or 20 MA output, 32 or 64 character by 16 line formats, complete with Deluxe Steel Cabinet and Power Supply ... \$199.95 plus \$3 P&I.*

RF Modulator kit (allows you to use your TV set as a monitor) ... \$49.95 postpaid

12" Video Monitor (10MHz bandwidth) ... \$139.95 plus \$5 P&I.*

Deluxe Steel Cabinet for the Explorer/85 ... \$49.95 plus \$3 P&I.*

Fan for cabinet ... \$15.00 plus \$1.50 P&I.*

ORDER A SPECIAL-PRICE EXPLORER/85 PAK — THERE'S ONE FOR EVERY NEED.

Beginner Pak (Save \$26.00) — You get Level A (Terminal Version) with Monitor Source Listing (\$25 value) AP-1, 5-amp power supply, Intel 8085 Users Manual ... (Reg. \$199.95) SPECIAL \$169.95 plus \$4 P&I.*

Experimenter Pak (Save \$53.40) — You get Level A (Hex Keypad/Display Version) with Hex Keypad/Display, Intel 8085 User Manual, Level A Hex Monitor Source Listing, and AP-1 5-amp power supply ... (Reg. \$299.95) SPECIAL \$246.55 plus \$6 P&I.*

Special Microsoft BASIC Pak (Save \$103.00) — You get Levels A (Terminal Version), B, D (4k RAM), E, 8k Microsoft in ROM, Intel 8085 User Manual, Level A Monitor Source Listing, and AP-1 5-amp power supply ... (Reg. \$439.70) SPECIAL \$336.70 plus \$7 P&I.*

Add a Rom-Version Text Editor/Assembler (Requires levels B and D or S100 Memory) ... \$99.95 plus \$2 P&I.*

Starter 8" Disk System — Includes Level A, B floppy disk controller, one CDC 8" disk-drive, two-drive cable, two S100 connectors, just add your own power supplies, cabinets and hardware ... (Reg. \$1065.00) SPECIAL \$999.95 plus \$13 P&I.*

32k Starter System, \$1049.95 plus \$13 P&I.*
4k Starter System, \$1149.95 plus \$13 P&I.*
64k Starter System, \$1449.95 plus \$13 P&I.*

Add to any of above Explorer steel cabinet, AP-1 5 amp power supply, Level C with two S100 connectors, disk drive cabinet and power supply, two sub-D connectors for connecting your printer and terminal ... (Reg. \$223.95) SPECIAL \$189.95 plus \$13 P&I.*

Complete 64K System — Wired & Tested ... \$1650.00 plus \$26 P&I.*

Special! Complete Business Software Pak (Save \$625.00) — Includes CP/M 2.2 Microsoft BASIC, General Ledger, Accounts Receivable, Accounts Payable, Payroll Package ... (Reg. \$1325) SPECIAL \$699.95 postpaid.

*P&I stands for "postage & insurance." For Canadian orders, double this amount.

Continental Credit Card Buyers Outside Connecticut:

TO ORDER
Call Toll Free:
800-243-7428

To Order From Connecticut, or For Technical Assistance, Call (203) 354-9375

CP/M is a reg. trademark of Digital Research

★ (Clip and mail entire ad) ★

SEND ME THE ITEMS CHECKED ABOVE

Total Enclosed (Conn. Residents add sales tax): \$

Paid by:

☐ Personal Check ☐ Cashier's Check/Money Order

☐ VISA ☐ MASTER CARD (Bank No. _____)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

City _____ State _____ Zip _____

ANNOUNCING TWO NEW TERMINALS

Smart • Fast • Graphics • Matching Modem and \$295 Printer

Netronics announces a state of the art breakthrough in terminals, now at prices you can afford, you can go on-line with data-bank and computer phone-line services. It's all yours: "electronic newspapers," educational services, Dow-Jones stock reports, games, recipes, personal computing with any level language, program exchanging, electronic bulletin boards ... and more every day!



Netronics offers two new terminals, both feature a full 56 key/128 character typewriter-style keyboard, baud rates to 19.2 kilobaud, a rugged steel cabinet and power supply. The simplest one, FASTERM-64, is a 16 line by 64 or 32 character per line unit, with a serial printer port for making hard copy of all incoming data, and optional provisions for block and special character graphics. The "smart" version, SMARTERM-80, features either 24 line by 80 characters per line or 16 by 40 characters per line, it offers on-screen editing with page-at-a-time printing, 12,000 pixel graphics, line graphics, absolute cursor addressing, underlining, reverse video, one-half intensity and much more ... simply plug them into your computer or our phone modem and be on-line instantly. Use your TV set (RF modulator required) or our deluxe green-phosphor monitor pictured above. For hard copy just add our matched printer.

Price breakthrough!!! Own the FASTERM-64, a complete terminal kit, ready to plug in for just \$199.95 or order the SMARTERM-80 kit for just \$299.95, (both available wired and tested.) Be on-line with the million-dollar computers and data services today ... we even supply the necessary subscription forms.

More good news: All the components in our terminals are available separately (see coupon), so you buy only what you need!!!

FASTERM-64 ... DISPLAY FORMAT: 64 or 32 characters/line by 16 lines ... 96 displayable ASCII characters (upper & lower case) ... 8 baud rates: 150, 300, 600, 1200, 2400 4800, 9600, 19,200 (switch sel.) ... LINE OUTPUT: RS232C or 20 ma current loop ... VIDEO OUTPUT: 1V P/P (EIA RS-170) ... CURSOR MODES: home & clear screen, erase to end of line, erase cursor line, cursor up & down, auto carriage return/line feed at end of line & auto scrolling ... REVERSE VIDEO ... BLINKING CURSOR ... PARITY: off, even or odd ... STOP BITS: 1, 1.5, 2 ... DATA BITS PER CHARACTER: 5, 6, 7 or 8 ... CHARACTER OUTPUT: 5 by 7 dot matrix in a 7 by 12 cell ... PRINTER OUTPUT: prints all incoming data ... 1K ON BOARD RAM ... 2K ON BOARD ROM ... CRYSTAL CONTROLLED ... COMPLETE WITH POWER SUPPLY ... OPTIONAL GRAPHICS MODE: includes 34 Greek & math characters plus 30 special graphics characters ... ASCII ENCODED KEYBOARD: 56 key/128 characters.

SMARTERM-80 ... DISPLAY FORMAT: 80 characters by 24 lines or 40 characters by 16 lines 128 displayable ASCII characters (upper & lower case) 8 baud rates: 110, 300, 600, 1200, 2400, 4800, 9600, 19,200 ... LINE OUTPUT: RS232C or 20 ma current loop ... VIDEO OUTPUT: 1V P/P (EIA RS-170) ... EDITING FEATURES: insert/delete line, insert/delete character, forward/back tab ... LINE OR PAGE TRANSMIT ... PAGE PRINT FUNCTION ... CURSOR POSITIONING: up, down, right, left, plus absolute cursor positioning with read back ... VISUAL ATTRIBUTES: underline, blink, reverse video, half intensity, & blank ... GRAPHICS: 12,000 pixel resolution block plus line graphics ... ON-SCREEN PARITY INDICATOR ... PARITY: off, even or odd ... STOP BITS: 110 baud 2, all others 1 ... CHAR. OUTPUT: 7 by 11 character in a 9 by 12 block ... PRINTER OUTPUT ... 60 OR 50 Hz VERTICAL REFRESH ... BLINKING BLOCK CURSOR ... CRYSTAL CONTROLLED ... 2K ON BOARD RAM ... ASCII ENCODED KEYBOARD: 56 key/128 character ... 4K ON BOARD ROM ... COMPLETE WITH POWER SUPPLY.

TELEPHONE MODEM 103 O/A ... FULL DUPLEX, FCC APPROVED ... DATA RATE: 300 baud ... INTERFACE: RS232C and TTY ... CONTROLS: talk/data switch (no need to connect and disconnect phone), originate/answer switch on rear panel ... NO POWER SUPPLY REQUIRED.

ASCII KEYBOARD ASCII-3 ... 56 KEY/128 CHARACTER ASCII ENCODED ... UPPER & LOWER CASE ... FULLY DEBOUNCED ... 2 KEY ROLL-OVER ... POS OR NEG LOGIC WITH POS STROBE ... REQUIRES +5 & -12V DC (SUPPLIED FROM VIDEO BOARDS) ... PRINTER COMET I ... SERIAL I/O TO 9600 BAUD ... 80 CHARACTER COLUMN (132 COMPRESSED) ... 10" TRACTOR FEED ... UPPER/LOWER CASE ... INDUSTRY STANDARD RIBBONS ... 4 CHARACTER SIZES ... 9 BY 7 DOT MATRIX ... BI-DIRECTIONAL PRINTING



Continental U.S.A. Credit Card Buyers Outside Connecticut
CALL TOLL FREE 800-243-7428

To Order From Connecticut Or For Tech. Assist. Call (203) 354-9375

NETRONICS R&D LTD. Dept.
333 Litchfield Road, New Milford, CT 06776

Please send the items checked below:

☐ COMPLETE FASTERM-64 TERMINAL (includes FASTVID-64 video board, ASCII-3 keyboard, steel cabinet and power supply) ... kit \$199.95 plus \$3 P&I ... wired & tested \$249.95 plus \$3 P&I ... graphics option: add \$19.95 to each of above

☐ COMPLETE SMARTERM-80 TERMINAL (includes SMARTVID-80 video board, ASCII-3 keyboard, steel cabinet and power supply) ... kit \$299.95 plus \$3 P&I ... wired & tested \$369.95 plus \$3 P&I

☐ FASTVID-64 VIDEO BOARD (requires +5 & -12V DC) ... kit \$99.95 plus \$3 P&I ... graphics option add \$19.95 ... wired & tested \$129.95 plus \$3 P&I ... graphics option add \$19.95

☐ SMARTVID-80 VIDEO BOARD (requires +5 & -12V DC) ... kit \$199.95 plus \$3 P&I ... wired & tested \$249.95 plus \$3 P&I

☐ DELUXE STEEL TERMINAL CABINET ... \$19.95 plus \$3 P&I

☐ ASCII-3 KEYBOARD (requires +5 & -12VDC) ... kit \$69.95 plus \$3 P&I ... wired & tested \$89.95 plus \$3 P&I

☐ POWER SUPPLY (powers ASCII-3 keyboard & video boards) ... kit only \$19.95 plus \$2 P&I

☐ ZENITH VIDEO MONITOR (high resolution green phosphor) ... wired & tested \$149.95 plus \$6 P&I

☐ TELEPHONE MODEM MODEL 103 O/A ... wired & tested \$189.95 plus \$3 P&I

☐ DOT MATRIX PRINTER Comet I ... wired & tested \$299.95 plus \$10 P&I

☐ RF MODULATOR MOD RF-1 ... kit only \$8.95 plus \$1 P&I

☐ 3FT-25 LEAD MOD/TERMINAL OR PRINTER/TERMINAL CONNECTOR CABLE ... \$14.95 ea plus \$2 P&I

For Canadian orders, double the postage. Conn. res. add sales tax.

Total Enclosed \$

☐ Personal Check ☐ Cashier's Check/Money Order

☐ VISA ☐ MasterCard (Bank No. _____)

Acct. No. _____ Exp. Date _____

Signature _____

Print Name _____

Address _____

City _____ State _____ Zip _____

NETRONICS Research & Development Ltd.
333 Litchfield Road, New Milford, CT 06776

COMPONENTS

7400	18	7454	19
7402	18	7470	30
7404	18	7472	30
7406	23	7474	30
7408	23	7476	30
7410	18	7480	55
7411	22	7481	100
7412	22	7482	100
7413	52	7490	30
7414	45	7491	30
7416	24	7492	30
7417	24	7494	60
7420	18	7495	60
7421	30	74100	60
7425	25	74107	25
7427	25	74112	40
7430	18	74115	40
7432	25	74144	250
7433	25	74152	80
7440	18	74148	100
7442	45	74154	100
7443	60	74155	45
7444	60	74160	80
7445	60	74161	80
7446	60	74162	80
7448	60	74174	80
7450	18	74177	80
7451	18	74393	100
7453	19		

74LS SERIES

74LS00	24	74LS122	40
74LS02	24	74LS123	85
74LS03	24	74LS125	85
74LS04	24	74LS126	85
74LS05	24	74LS132	70
74LS06	30	74LS136	85
74LS08	28	74LS138	65
74LS10	24	74LS139	65
74LS11	33	74LS151	10
74LS12	33	74LS151	70
74LS13	45	74LS153	70
74LS14	89	74LS157	70
74LS20	24	74LS158	70
74LS21	24	74LS161	85
74LS22	30	74LS162	85
74LS27	28	74LS163	85
74LS28	32	74LS164	85
74LS30	24	74LS165	85
74LS32	32	74LS169	155
74LS37	30	74LS170	155
74LS38	30	74LS174	85
74LS42	50	74LS175	85
74LS43	70	74LS180	90
74LS51	24	74LS191	90
74LS55	35	74LS221	110
74LS54	38	74LS240	95
74LS55	48	74LS241	95
74LS56	38	74LS244	95
74LS58	50	74LS245	155
74LS59	70	74LS248	100
74LS66	38	74LS249	90
74LS90	60	74LS251	120
74LS91	85	74LS253	80
74LS92	65	74LS257	80
74LS93	60	74LS258	80
74LS95	80	74LS259	125
74LS107	38	74LS260	80
74LS109	38	74LS271	150
74LS112	40	74LS275	300
74LS113	40	74LS279	50
74LS114	45	74LS283	75
		74LS373	90
		74LS374	150
		74LS377	140

74S SERIES

74S00	35	74S86	110
74S02	38	74S112	145
74S03	38	74S132	110
74S04	45	74S136	95
74S05	65	74S140	125
74S08	40	74S158	120
74S10	55	74S174	95
74S15	55	74S175	95
74S20	55	74S181	400
74S22	75	74S182	275
74S30	35	74S186	350
74S37	25	74S240	350
74S51	60	74S244	350
74S65	95	74S471	950
74S74	50	74S472	1900
74S85	200		

EPROMS

1702	4 25	8/3 95 ea
2708	2 95	8/2 85 ea
2716 (5V)	5 00	8/4 50 ea
2732 (5V)	8 95	8/8 00 ea
2732 (5V)	10 50	8/8 25 ea
27512 (5V)	11 50	8/10 25 ea

DYNAMIC RAMS

4027	2 00	8/1 75 ea
4116 200ns	1 75	8/13 00
4164 200ns	9 50	

STATIC RAMS

2111	2 85	8/2 50 ea
2112	2 85	8/2 50 ea
2114	4 00	8/4 00
2114L 200ns	5 25	4/2 00 ea
HM6116 200ns	11 50	4/10 50 ea

MISC

8126	120		
8128	120		
8038	275	Z80A	8 50
8080A	375	Z80A PIO	6 00
8155	10 50	6502	6 00
8255	4 50	6502A	12 00
MC1330	1 85	8055A	8 50
MC1350	1 15	MC6800	7 75
MC1358	1 50		
LM1458	55		
LM380	110		
LM386	140		
LM565	95		
LM741	25	VOLTAGE REGULATORS	
LM1310	2 90	7805	
LM1800	2 95	7806	
LM1889	1 45	7808	
1488	95	7812	
1489	95	7818	b5
8212	1 95	7905	
8216	1 80	7906	
1103A	95	7912	
		7918	

QUV-T8/2 by LOGICAL DEV.
"EPROM-Eraser"
 Erase up to 15 EPROM'S
 in 30min. **\$69.95**
 QTY. PRICE AVAIL.

SPECIALS

ZENITH ZVM-121
 Video Monitor / Green!!

12 inch
 15 MHz ☆

\$ 118.50

8255 → \$5.95

8748-8 → \$31.00

3341PC → \$2.00

MM5060 → 35c

MC6800 → \$7.75

MC6802 → \$14.95

MC6850 → \$4.50

MC6821 → \$4.95

.....

8 Pos. DIP

SWITCH

\$1.35ea.

10pcs/\$10.00

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

CONCORD
COMPUTER
PRODUCTS

1971 SO. STATE COLLEGE
 ANAHEIM, CALIF. 92806

(714) 937-0637

Master Card CHECK M/O

NO COD

\$10 MIN ORDER, C.A. RES. ADD 6% FRT

\$10 25 50 75 100 200 400 800 1000 UP CALL

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1971 SO. STATE COLLEGE

ANAHEIM, CALIF. 92806

(714) 937-0637

Master Card CHECK M/O

NO COD

\$10 MIN ORDER, C.A. RES. ADD 6% FRT

\$10 25 50 75 100 200 400 800 1000 UP CALL

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

1971 SO. STATE COLLEGE

ANAHEIM, CALIF. 92806

WAMECO

THE COMPLETE PC BOARD HOUSE EVERYTHING FOR THE S-100 BUSS

TWO NEW BOARDS

CRT-1 VIDEO BOARD

- * SIMULATES INTELLIGENT TERMINAL
- * SEPARATE & COMPOSITE VIDEO
- * LT. PEN INTERFACE
- * 4K X 8 DISPLAY RAM
- * APL PROM LOCATION
- * 4K X 4 ATTRIBUTE RAM
- * 2K OR 4K OF PROGRAM LOCATION
- * KEYBOARD INTERFACE

PCBD.....	\$40.95
KIT.....	\$259.95
A & T.....	\$319.95

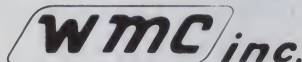
MEM-4, RAM/ROM 65K X 8

- * USES TMN 2016 - TMS 4016 RAMS OR 2716 EPROM IN ANY LOCATION
- * EXTENDED ADDRESSING
- * EXPANDABLE IN 2K BLOCKS
- * HCMOS COMPATABLE FOR ALL SUPPORT
- * BI - DIRECTIONAL BUSSING AVAILABLE ON DI OR DO LINES (SAME MEM-3)
- * BANK SELECTABLE USING EXTENDED ADDRESSING ON UPPER PORTION OF MEMORY

PCBD.....	\$40.95
KIT (LESS RAM).....	\$109.95
A & T LESS RAM.....	\$139.95

NOW DISTRIBUTING FOR EXTEK. EXTEK-64 EXPANSION FOR SSM'S PB-1. PROGRAMS 2732, 2732A AND 2764. ON THE PB-1 BANK DISABLE FOR PROGRAMMING SOCKET, SOCKETS EXTENDS ABOVE THE PB-1 SO NO EXTENDER IS REQUIRED. CP/M COMPATABLE SOFTWARE DISC IS INCLUDED.
KIT..... \$115.95, A & T..... \$129.95

DEALER INQUIRIES INVITED, UNIVERSITY DISCOUNTS AVAILABLE
AT YOUR LOCAL DEALER



WAMECO, INC., P. O. BOX 877 • EL GRANADA, CA 94018 • (415) 728-9114



CALIFORNIA COMPUTER SYSTEMS

S100	
2032 32K STATIC RAM A & T 200 NSEC	\$468.00
2116 16K STATIC RAM A & T 200 NSEC	\$279.50
2065 64K DYNAMIC RAM A & T	\$351.00
2200 S-100 MAIN FRAM A & T	\$500.00
2422A FLOPPY DISC WITH CP/M 2.2	\$329.95
2831A ARITHMETIC PROCESSOR A & T	\$552.50
2810A Z80 CPU A & T	\$249.95
2710A 4 SERIAL 1/0 A & T	\$291.95
2719A 2 SERIAL, 2 PARALLEL A & T	\$305.95
2720A 4 PARALLEL A & T	\$214.95
PROTO BOARDS WW	\$39.95

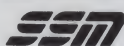
APPLE PRODUCTS

7114A 12K ROM/PROM	\$99.95
7424A CALENDAR/CLOCK	\$106.95
7440A PROGRAMMABLE TIMER	\$98.50
7470A A TO D CONVERTER	\$105.95
7490A GPIB (IE 488) INTERFACE	\$182.00
7710A ASYNC SERIAL	\$125.95
7712A SYNC SERIAL	\$153.95
7720A PARALLEL STANDARD	\$105.00
7720B PARALLEL CENTRONICS	\$105.00
7811B ARITHMETIC PROCESSOR W/DISC	\$342.95
7811C ARITHMETIC PROCESSOR W/ROM	\$342.95
7520A EXTENDER	\$23.50
7300A APPLE CLIP	\$8.00

SOFTWARE

23-01 CP/M MACRO ASSEMBLER ON DISK	\$76.95
24-01 CP/M SYMBOLIC INSTRUCTION DEBUGGER	\$64.25
25-01 CP/M TEXT FORMATER	\$64.25
26-01 CP/M BACKGROUND PRINT UTILITY	\$42.95

OTHER CCS PRODUCTS ARE AVAILABLE
CALL FOR PRICE



MICROCOMPUTER PRODUCTS

S100 PRODUCTS

CBIA 8080 PROCESSOR PCBD	\$32.95
KIT	\$155.95 A & T \$215.95
CB-2 280 PROCESSOR BOARD	
KIT	\$198.95 A & T \$269.95
VBIC 64 x 16 VIDEO, PCBD	\$32.95
KIT	\$153.95 A & T \$199.95
VB2 64 x 16 VIDEO, PCBD	\$32.95
KIT	\$175.95 A & T \$234.95
VB3 80 CHARACTER VIDEO 4MHZ	
KIT	\$345.95 A & T \$425.95
UPGRADE RAMS FOR VB-3	\$42.00
IO4 2 PARALLEL 2 SERIAL PCBD	\$32.95
KIT	\$155.95 A & T \$194.95
PB-1 2708 2716 PROGRAMMER BOARD	
KIT	\$135.95 A & T \$185.95
MB-10 16K STATIC RAM	
KIT	\$299.95 A & T \$339.95

APPLE PRODUCTS

A488 IEEE 488 INTERFACE	\$399.95
A10 - II SERIAL/PARALLEL INTERFACE A & T	\$178.00
ASIO SERIAL 1/0 A & T	\$97.95
APIO PARALLEL 1/0 W/O CABLES A & T	\$87.95

OTHER SSM PRODUCTS ARE AVAILABLE
CALL FOR PRICES

MIKOS

MONDAY-FRIDAY 8:00 TO 12:00 1:00 TO 5:30
THURSDAYS 8:00 TO 9:00 P.M.

(415) 728-9121

P.O. BOX 955 • EL GRANADA, CA 94018

PLEASE SEND FOR IC, XISTOR AND COMPUTER PARTS LIST

JULY SPECIAL SALE ON PREPAID ORDERS

(CHARGE CARDS, C.O.D. OR P.O.'S NOT AVAILABLE)
MUST MENTION AD FOR SPECIAL PRICES

INTRODUCTION SPECIAL

SSM PB-1 EXPANSION KIT BY EXTEK. ADAPTS PB-1 FOR PROGRAMMING 2732, 2732A AND 2764. BANK DISABLE FOR PROGRAMMING SOCKETS. CP/M SOFTWARE DISC INCLUDED. KIT... \$105.95, A & T... \$119.95

WMC inc. WAMECO INC.
BOARDS WITH MIKOS PARTS

MEM-3 32K STATIC RAM, PCBD	\$36.95
KIT LESS RAM	\$95.95 A & T \$135.95
CPU-2 Z80 PROCESSOR, PCBD	\$32.95
KIT LESS ROM	\$109.95 A & T \$149.95
EPM-2 16K/32K EPROM, PCBD	\$32.95
KIT LESS ROM	\$65.95 A & T \$99.95
FPB-1 FRONT PANEL, PCBD	\$48.50
KIT	\$144.95 A & T \$184.95
CRT-1 16 OR 24 x 80 VIDEO BOARD, PCBD	\$38.95
KIT	\$249.95 A & T \$299.95
MEM-4 65K RAM/ROM BOARD, PCBD	\$38.95
KIT LESS MEMORY	\$99.95 A & T LESS MEMORY \$129.95

OTHER WAMECO PRODUCTS ARE AVAILABLE.
CALL FOR PRICES

MIKOS PARTS ASSORTMENTS ARE ALL FACTORY MARKED PARTS. KITS INCLUDE ALL PARTS LISTED AS REQUIRED FOR THE COMPLETE KIT LESS PARTS LISTED. ALL SOCKETS INCLUDED.

LARGE SELECTION OF LS TTL AVAILABLE.

PURCHASE \$50.00 WORTH OF LS TTL AND GET 10% CREDIT TOWARD ADDITIONAL PURCHASES. PREPAID ORDERS ONLY.

VISA or MASTERCHARGE: Send account number, interbank number, expiration date and sign your order. Approx. postage will be added. Orders with check or money order will be sent post paid in U.S. If you are not a regular customer, please use charge, cashier's check or postal money order. Otherwise there will be a two-week delay for checks to clear. Calif. residents add 6% tax. Money back 30-day guarantee. We cannot accept returned IC's that have been soldered to. Prices subject to change without notice. \$20 minimum order. \$2.00 service charge on orders less than \$20.00.

DIGITAL RESEARCH COMPUTERS

(214) 271-3538

32K S-100 EPROM CARD

NEW!



\$79.95
KIT

USES 2716's

Blank PC Board - \$34

ASSEMBLED & TESTED
ADD \$30

SPECIAL: 2716 EPROM's (450 NS) Are \$9.95 Ea. With Above Kit

KIT FEATURES

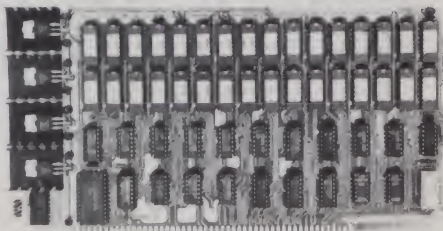
- 1 Uses +5V only 2716 (2Kx8) EPROM's
- 2 Allows up to 32K of software on line!
- 3 IEEE S-100 Compatible
- 4 Addressable as two independent 16K blocks
- 5 Cromemco extended or Northstar bank select
- 6 On board wait state circuitry if needed
- 7 Any or all EPROM locations can be disabled
- 8 Double sided PC board, solder-masked, silk-screened
- 9 Gold plated contact fingers
- 10 Unselected EPROM's automatically powered down for low power
- 11 Fully buffered and bypassed
- 12 Easy and quick to assemble

16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

\$149.95
KIT

FOR 4MHZ
ADD \$10



KIT FEATURES

- 1 Addressable as four separate 4K Blocks
- 2 ON BOARD BANK SELECT circuitry (Cromemco Standard!) Allows up to 512K on line!
- 3 Uses 2114 (450NS) 4K Static Rams
- 4 ON BOARD SELECTABLE WAIT STATES
- 5 Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers
- 6 All address and data lines fully buffered
- 7 Kit includes ALL parts and sockets
- 8 PHANTOM is jumpered to PIN 67
- 9 LOW POWER under 1.5 amps TYPICAL from the +8 Volt Buss
- 10 Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-\$33

LOW PROFILE SOCKET SET-\$12

SUPPORT IC'S & CAPS-\$19.95

ASSEMBLED & TESTED-ADD \$35

**OUR #1 SELLING
RAM BOARD!**

STEREO! S-100 SOUND COMPUTER BOARD

NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

KIT FEATURES:

- TWO GI SOUND COMPUTER IC'S
- FOUR PARALLEL I/O PORTS ON BOARD
- USES ON BOARD AUDIO AMPS OR YOUR STEREO
- ON BOARD PROTO TYPING AREA
- ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED
- PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
- EASY, QUICK, AND FUN TO BUILD WITH FULL INSTRUCTIONS
- USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY

Both Basic and Assembly Language Programming examples are included

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M™ compatible diskette or 2708 or 2716. Diskette - \$24.95 2708 - \$19.95 2716 - \$29.95. Diskette includes the source. EPROM'S are ORG at E000H. (Diskette is 8 Inch Soft Sealed)

4K STATIC RAM

National Semi. MM5257. Arranged 4K x 1. +5V, 18 PIN DIP. A Lower Power, Plug in Replacement for TMS 4044. 450 NS. Several Boards on the Market Will Accept These Rams. SUPER SURPLUS PURCHASE! PRIME NEW UNITS!

8 FOR \$16 32 FOR \$59.95

Digital Research Computers
(OF TEXAS)

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

64K S100 STATIC RAM

\$399.00
KIT

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD
WITH DOCUMENTATION
\$55

SUPPORT IC's & CAPS
\$17.50

FULL SOCKET SET
\$14.50

FULLY SUPPORTS THE
NEW IEEE 696 S100
STANDARD
(AS PROPOSED)

FOR 56K KIT \$349

ASSEMBLED AND
TESTED ADD \$40



FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports IEEE 696 24 BIT Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- 2716 EPROMs may be installed in any of top 48K.
- Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- BOARD may be partially populated as 56K.

64K SS-50 STATIC RAM

\$299.00
(48K KIT)

NEW!

LOW POWER!

RAM OR EPROM!

BLANK PC BOARD
WITH
DOCUMENTATION
\$52

SUPPORT IC's & CAPS
\$18.00

FULL SOCKET SET
\$15.00

56K Kit \$349

64K KIT \$395

ASSEMBLED AND
TESTED ADD \$40



FEATURES:

- Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- Fully supports Extended Addressing.
- 64K draws only approximately 500 MA.
- 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- 2716 EPROMs may be installed anywhere on Board.
- Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- One Board supports both RAM and EPROM.
- RAM supports 2MHZ operation at no extra charge!
- Board may be partially populated in 16K increments.

SPECIAL PURCHASE!

UART SALE!

TR1602B — SAME AS TMS6011,
AY5-1013, ETC. 40 PIN DIP

TR1602B

\$295
EACH

4 For \$10.00

CRT CONTROLLER CHIP

SMC #CRT 5037. PROGRAMMABLE FOR 80 x 24, ETC. VERY RARE SURPLUS FIND. WITH PIN OUT. \$12.95 EACH.

NEW! G.I. COMPUTER SOUND CHIP

AY3-8910. As featured in July, 1979 BYTE! A fantastically powerful Sound & Music Generator. Perfect for use with any 8 Bit Microprocessor. Contains 3 Tone Channels. Noise Generator. 3 Channels of Amplitude Control. 16 bit Envelope Period Control, 2-8 Bit Parallel I/O. 3 D to A Converters, plus much more! All in one 40 Pin DIP. Super easy interface to the S-100 or other busses \$11.95

PRICE CUT!
SPECIAL OFFER: \$14.95 each Add \$3 for 60 page Data Manual.

TERMS: Add \$2.00 postage. We pay balance. Orders under \$15 add 75¢ handling. No C.O.D. We accept Visa and MasterCard. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over \$50, add 85¢ for insurance.

ALL SALES ARE MADE SUBJECT TO THE TERMS OF OUR 90 DAY LIMITED WARRANTY. A COPY OF THIS WARRANTY IS AVAILABLE FREE, ON REQUEST.

*TRADEMARK OF DIGITAL RESEARCH.

WE ARE NOT ASSOCIATED WITH DIGITAL RESEARCH OF CALIFORNIA, THE SUPPLIERS OF CPM SOFTWARE.

IBM and APPLE COMPATIBLE BOARDS!

STB-80™ APPLE VIDEO BOARD



\$259
ASSEMBLED
& TESTED

FEATURES:

- ★ 24 x 80 Display
- ★ Direct Keyboard Entry for Lower Case and Special Characters
- ★ Line Graphics
- ★ Software Screen Switch to Standard Apple
- ★ Emulates all Basic Screen Formatting Commands
- ★ Compatible with PASCAL & CP/M
- ★ Software Controllable Inverse Video by Character & Screen

SOFTWARE

#1 DOS TOOL KIT PATCH DISKETTE

This patches the APPLE EDITOR & ASSEMBLER for use with the STB-80.
\$24.95

#2 APPLE WRITER PATCH DISKETTE

This patches the APPLE WRITER WORD PROCESSOR package for use with the STB-80.
\$24.95

New

APPLE MEMORY EXPANSION BOARDS

STB-16™ 16K BOARD

- ★ Assembled & Tested
- ★ Increases 48K to 64K
- ★ Compatible with PASCAL, CP/M DOS 3.3, PILOT, COBOL, FORTRAN, VISICALC, INT. BASIC, APPLE SOFT BASIC, etc.
- ★ Easy to Install. Plug in and Go. No Cables. No chips to Remove.
- ★ Expandable to 64K

\$139

16K A & T

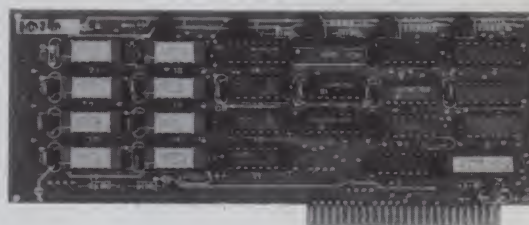
(64K UPGRADE FOR STB-16 IS \$189)

STB-64™ 64K BOARD

\$299

64K A & T

New



- ★ Assembled and Tested
- ★ Uses 64K RAMS
- ★ Four STB-16's on one Card
- ★ Software Bank Selectable
- ★ Compatible with 16K RAM Card Software
- ★ DOS 3.3 Support Disk FREE with Purchase

STB-128™ 128K APPLE BOARD

MULTI-PURPOSE MEMORY BOARD & DISK EMULATOR

- ★ 128K of Expansion Memory
- ★ Includes DOS 3.3 Support Disk
- ★ Eight STB-16's on one Card
- ★ Processor Port for Direct Access Control
- ★ Uses 64K RAMS

\$549

128K A & T

STB DOS 3.3 SUPPORT PROGRAM DISK

- ★ Disk Emulator (1 STB-128 or 2 STB-64 Req)
- ★ Disk "Cache" (1 STB-128 or 2 STB-64 Req)
- ★ Fast Basic Loader
- ★ Memory Tester
- ★ DOS Relocater (Free 8K for Basic)
- ★ Picture Flipper/Saver

\$29.95

(FREE with STB-64 or STB-128)

VISICALC EXPANSION SOFTWARE

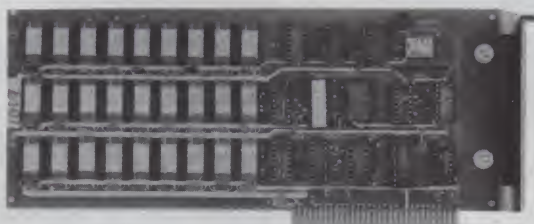
Expands Visicalc 3.3 using our STB 64/128 memory cards. 145K work space using our STB 128 or 85K with our STB 64. Simple one step operation.

Price **\$79.95**

New

IBM PC MEMORY EXPANSION BOARDS

New



PUT UP TO 256K ON LINE
IN YOUR IBM P.C.!

64K — \$349 (STB-I164)

128K — \$519 (STB-I128)

192K — \$649 (STB-I192)

ALL ASSEMBLED & TESTED

EXPANSION KIT TO GO FROM 64K
TO 192K IS \$325.

- ★ Expand Your IBM to 256K Using Only one Slot.
- ★ Available in 64, 128, or 192K Sizes
- ★ Easy to Install, Use in Any of the 5 Expansion Slots
- ★ Mounting Bracket, Included for Secure, Reliable Operation
- ★ Parity — All Three Models Support Parity Error Testing
- ★ One Year Limited Warranty on all Boards

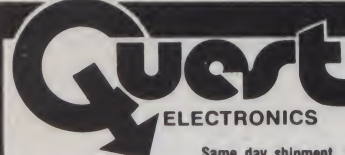
IBM PC TM OF IBM CORP. APPLE AND APPLEWRITER TM OF APPLE COMPUTERS. CP/M TM OF DIGITAL RESEARCH. VISICALC TM OF VISICORP.

DIGITAL RESEARCH COMPUTERS IS PROUD TO BE ANNOUNCED AS THE NATIONAL MAIL ORDER OUTLET FOR THE FINE LINE OF S.T.B. "SIMPLY THE BEST" BOARDS.

Digital Research Computers
(OF TEXAS)

P.O. BOX 401565 • GARLAND, TEXAS 75040 • (214) 271-3538

TERMS: Add \$2.00 postage. We pay balance. Orders under \$15 add 75¢ handling. No C.O.D. We accept Visa and MasterCard. Tex. Res. add 5% Tax. Foreign orders (except Canada) add 20% P & H. Orders over \$50, add 85¢ for insurance.



FULL LINE ALL PARTS & COMPUTER PRODUCTS

P.O. Box 4430S
Santa Clara, CA 95054
Will call: 2322 Walsh Ave.
(408) 988-1640

Same day shipment. First line parts only. Factory tested. Guaranteed money back. Quality IC's and other components at factory prices.

INTEGRATED CIRCUITS

Phone orders only (800) 538-8196

7400TTL	1M3177	1.65	CM4017	1.05	8726	1.80	UART-PIPO	1.95	
7400N	1M3178	1.73	CM4018	94	8728	1.95	AVS-1013	3.95	
7402N	1M3179	1.49	CM4019	85	8739	99	DA155	3.10	
7404N	22	LM320K-5	1.35	CM4020	95	8739	99	Complete Set	9.50
7405N	1M3201	1.35	CM4021	95	8739	99	Adv. Clock Kit	17.95	
7410N	1M3206	1.35	CM4022	110	2101-1	1.95	Digital Clock Kit	19.75	
7414N	55	LM320T-5	85	CM4023	28	2102-1			
7420N	1M3207	85	CM4024	25	2102A-4	1.25			
7430N	1M3207-12	85	CM4025	23	2102AN-2L	1.65			
7442N	69	LM320T-15	85	CM4026	23	2104A-4	4.95		
7445N	69	LM323K-5	4.95	CM4027	85	2111-1	2.99		
7447N	89	LM324N	58	CM4028	80	2112-1	2.99		
7448N	69	LM324N	58	CM4029	85	2114	2.24		
7474N	35	LM340K-5	1.35	CM4030	45	2114L-300ms	2.50		
7475N	49	LM340K-8	1.35	CM4031	85	2114L-450ms	2.50		
7485N	85	LM340K-12	1.35	CM4040	95	4118 200ms	2.50		
7488N	170	LM340K-15	1.35	CM4042	75	8-4118 200ms	14.95		
7489N	35	LM340K-24	1.35	CM4043	85	MM5280	3.00		
7490N	55	LM340T-5	75	CM4044	85	MM5282	3.95		
74100N	100	LM340T-8	75	CM4045	85	MM52126	5.75		
74107N	30	LM340T-12	75	CM4046	85	MM52129	1.75		
74123N	55	LM340T-15	75	CM4050	55	MM52131	4.95		
74125N	55	LM340T-18	75	CM4051	55	9358	3.50		
74145N	60	LM340T-24	75	CM4060	142	4100	10.00		
74150N	120	LM350	5.50	CM4065	71	416	2.50		
74151N	85	LM377	2.29	CM4068	39	2M016	18.50		
74152N	85	LM380N	1.60	CM4070	30	MM5118	4.95		
74157N	55	LM381	1.60	CM4072	30	MM5112	3.00		
74161N	70	LM382	1.60	CM4073	35	MM5114	14.45		
74170N	85	LM373N	85	CM4075	30	MM5110	14.45		
74174N	89	LM373N	85	CM4076	35	MM5109	9.95		
74175N	85	LM374N	35	CM4078	30	MM5107	7.95		
74190N	115	LM374N	35	CM4081	30	MM5104	14.45		
74192N	79	LM374N	35	CM4082	30	MM5103	14.45		
74193N	79	LM374N	35	CM4083	30	MM5102	14.45		
74211N	125	LM374N	35	CM4084	30	MM5101	14.45		
74212N	125	LM374N	35	CM4085	30	MM5100	14.45		
74213N	125	LM374N	35	CM4086	30	MM5100	14.45		
74214N	125	LM374N	35	CM4087	30	MM5100	14.45		
74215N	125	LM374N	35	CM4088	30	MM5100	14.45		
74216N	125	LM374N	35	CM4089	30	MM5100	14.45		
74217N	125	LM374N	35	CM4090	30	MM5100	14.45		
74218N	125	LM374N	35	CM4091	30	MM5100	14.45		
74219N	125	LM374N	35	CM4092	30	MM5100	14.45		
74220N	125	LM374N	35	CM4093	30	MM5100	14.45		
74221N	125	LM374N	35	CM4094	30	MM5100	14.45		
74222N	125	LM374N	35	CM4095	30	MM5100	14.45		
74223N	125	LM374N	35	CM4096	30	MM5100	14.45		
74224N	125	LM374N	35	CM4097	30	MM5100	14.45		
74225N	125	LM374N	35	CM4098	30	MM5100	14.45		
74226N	125	LM374N	35	CM4099	30	MM5100	14.45		
74227N	125	LM374N	35	CM4100	30	MM5100	14.45		
74228N	125	LM374N	35	CM4101	30	MM5100	14.45		
74229N	125	LM374N	35	CM4102	30	MM5100	14.45		
74230N	125	LM374N	35	CM4103	30	MM5100	14.45		
74231N	125	LM374N	35	CM4104	30	MM5100	14.45		
74232N	125	LM374N	35	CM4105	30	MM5100	14.45		
74233N	125	LM374N	35	CM4106	30	MM5100	14.45		
74234N	125	LM374N	35	CM4107	30	MM5100	14.45		
74235N	125	LM374N	35	CM4108	30	MM5100	14.45		
74236N	125	LM374N	35	CM4109	30	MM5100	14.45		
74237N	125	LM374N	35	CM4110	30	MM5100	14.45		
74238N	125	LM374N	35	CM4111	30	MM5100	14.45		
74239N	125	LM374N	35	CM4112	30	MM5100	14.45		
74240N	125	LM374N	35	CM4113	30	MM5100	14.45		
74241N	125	LM374N	35	CM4114	30	MM5100	14.45		
74242N	125	LM374N	35	CM4115	30	MM5100	14.45		
74243N	125	LM374N	35	CM4116	30	MM5100	14.45		
74244N	125	LM374N	35	CM4117	30	MM5100	14.45		
74245N	125	LM374N	35	CM4118	30	MM5100	14.45		
74246N	125	LM374N	35	CM4119	30	MM5100	14.45		
74247N	125	LM374N	35	CM4120	30	MM5100	14.45		
74248N	125	LM374N	35	CM4121	30	MM5100	14.45		
74249N	125	LM374N	35	CM4122	30	MM5100	14.45		
74250N	125	LM374N	35	CM4123	30	MM5100	14.45		
74251N	125	LM374N	35	CM4124	30	MM5100	14.45		
74252N	125	LM374N	35	CM4125	30	MM5100	14.45		
74253N	125	LM374N	35	CM4126	30	MM5100	14.45		
74254N	125	LM374N	35	CM4127	30	MM5100	14.45		
74255N	125	LM374N	35	CM4128	30	MM5100	14.45		
74256N	125	LM374N	35	CM4129	30	MM5100	14.45		
74257N	125	LM374N	35	CM4130	30	MM5100	14.45		
74258N	125	LM374N	35	CM4131	30	MM5100	14.45		
74259N	125	LM374N	35	CM4132	30	MM5100	14.45		
74260N	125	LM374N	35	CM4133	30	MM5100	14.45		
74261N	125	LM374N	35	CM4134	30	MM5100	14.45		
74262N	125	LM374N	35	CM4135	30	MM5100	14.45		
74263N	125	LM374N	35	CM4136	30	MM5100	14.45		
74264N	125	LM374N	35	CM4137	30	MM5100	14.45		
74265N	125	LM374N	35	CM4138	30	MM5100	14.45		
74266N	125	LM374N	35	CM4139	30	MM5100	14.45		
74267N	125	LM374N	35	CM4140	30	MM5100	14.45		
74268N	125	LM374N	35	CM4141	30	MM5100	14.45		
74269N	125	LM374N	35	CM4142	30	MM5100	14.45		
74270N	125	LM374N	35	CM4143	30	MM5100	14.45		
74271N	125	LM374N	35	CM4144	30	MM5100	14.45		
74272N	125	LM374N	35	CM4145	30	MM5100	14.45		
74273N	125	LM374N	35	CM4146	30	MM5100	14.45		
74274N	125	LM374N	35	CM4147	30	MM5100	14.45		
74275N	125	LM374N	35	CM4148	30	MM5100	14.45		
74276N	125	LM374N	35	CM4149	30	MM5100	14.45		
74277N	125	LM374N	35	CM4150	30	MM5100	14.45		
74278N	125	LM374N	35	CM4151	30	MM5100	14.45		
74279N	125	LM374N	35	CM4152	30	MM5100	14.45		
74280N	125	LM374N	35	CM4153	30	MM5100	14.45		
74281N	125	LM374N	35	CM4154	30	MM5100	14.45		
74282N	125	LM374N	35	CM4155	30	MM5100	14.45		
74283N	125	LM374N	35	CM4156	30	MM5100	14.45		
74284N	125	LM374N	35	CM4157	30	MM5100	14.45		
74285N	125	LM374N	35	CM4158	30	MM5100	14.45		
74286N	125	LM374N	35	CM4159	30	MM5100	14.45		
74287N	125	LM374N	35	CM4160	30	MM5100	14.45		
74288N	125	LM374N	35	CM4161	30	MM5100	14.45		
74289N	125	LM374N	35	CM4162	30	MM5100	14.45		
74290N	125	LM374N	35	CM4163	30	MM5100	14.45		
74291N	125	LM374N	35	CM4164	30	MM5100	14.45		
74292N	125	LM374N	35	CM4165	30	MM5100	14.45		
74293N	125	LM374N	35	CM4166	30	MM5100	14.45		
74294N	125	LM374N	35	CM4167	30	MM5100	14.45		
74295N	125	LM374N	35	CM4168	30	MM5100	14.45		
74296N	125	LM374N	35	CM4169	30	MM5100	14.45		
74297N	125	LM374N	35	CM4170	30	MM5100	14.45		
74298N	125	LM374N	35	CM4171	30	MM5100	14.45		
74299N	125	LM374N	35	CM4172	30	MM5100	14.45		
74300N	125	LM374N	35	CM4173	30	MM5100	14.45		
74301N	125	LM374N	35	CM4174	30	MM5100	14.45		
74302N	125	LM374N	35	CM4175	30	MM5100	14.45		
74303N	125	LM374N	35	CM4176	30	MM5100	14.45		
74304N	125	LM374N	35	CM4177	30	MM5100	14.45		
74305N	125	LM374N	35	CM4178	30	MM5100	14.45		
74306N	125	LM374N	35	CM4179	30	MM5100	14.45		
74307N	125	LM374N	35	CM4180	30	MM5100	14.45		
74308N	125	LM374N	35	CM4181	30	MM5100	14.45		
74309N	125	LM374N	35	CM4182	30	MM5100	14.45		
74310N	125	LM374N	35	CM4183	30	MM5100	14.45		
74311N	125	LM374N	35	CM4184	30	MM5100	14.45		
74312N	125	LM374N	35	CM4185	30	MM5100	14.45		
74313N	125	LM374N	35	CM4186	30	MM5100	14.45		
74314N	125	LM374N	35	CM4187	30	MM5100	14.45		
74315N	125	LM374N	35	CM4188	30	MM5100	14.45		
74316N	125	LM374N	35	CM4189	30	MM5100	14.45		
74317N	125	LM374N	35	CM4190	30	MM5100	14.45		
74318N	125	LM374N	35	CM4191	30	MM5100	14.45		
74319N	125	LM374N	35	CM4192	30	MM5100	14.45		
74320N	125	LM374N	35	CM4193	30	MM5100	14.45		
74321N	125	LM374N	35	CM4194	30	MM5100	14.45		
74322N	125	LM374N	35	CM4195	30	MM5100	14.45		
74323N	125	LM374N	35	CM4196	30	MM5100	14.45		
74324N	125	LM374N	35	CM4197	30	MM5100	14.45		
74325N	125	LM374N	35	CM4198</					

Orange County • Sunnyvale San Diego • Los Angeles San Fernando Valley • Dallas

Dot Matrix Printers

NEW EPSONS with GRAFTRAX-plus

Epson has improved and upgraded their best selling line of printers to include their new GRAFTRAX-plus graphics package. Features now include; 9 x 9 matrix, bi-directional/logic seeking, line spacing to n/216, programmable forms length and horizontal tabs, skip over perf, italics fonts, international symbols, superscript/subscript, normal, emphasized, double-strike, and double-emphasized print, underlining, line drawing graphics, 60/120 DPI bit image, software reset, adjustable right margin, and true back space.

MX-80 with GRAFTRAX-plus 80 column, 80 CPS, adjustable pin feed.

PRM-28080 MX-80 w/GRAFTRAX-plus \$479.95

MX-80FT with GRAFTRAX-plus same as MX-80 with friction feed added.

PRM-28082 MX-80FT w/GRAFTRAX-plus \$559.95

MX-100 with GRAFTRAX-plus 132 column, correspondence quality, up to 15" paper, friction feed & adjustable pin feed, 9 x 9 dot matrix, 80 CPS.

PRM-28100 MX-100 w/GRAFTRAX-plus \$754.95

PRA-27084 Serial interface \$54.95
PRA-27088 Serial int'l & 2K buffer \$144.95
PRA-27081 Apple card \$39.95
PRA-27082 Apple cable \$19.95
PRA-27086 IEEE 488 card \$52.95
PRA-27087 TRS-80 cable \$24.95
PRA-27085 GRAFTRAX II \$59.95
PRA-28085 GRAFTRAX-plus \$79.95
PRA-27090 Extra print head \$44.95
PRA-27083 MX-80 ribbon cart. \$13.95
PRA-27101 MX-100 ribbon only \$9.95

BETTER THAN EPSON! - Okidata

Microline 82A 80/132 column, 120 CPS, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (optional), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000 character print head, bi-directional/logic seeking, both serial & parallel interfaces included, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics

PRM-43082 Friction & pin feed \$499.95

Microline 83A 132/232 column, 120 CPS, handles forms up to 15" wide, removable tractor, plus all the features of the 82A.

PRM-43083 with FREE tractor \$744.95

Microline 84 132/232 column, 200 CPS, full dot graphics built in, handles forms up to 15" wide, plus all the features of the 83A.

PRM-43084 Centronics parallel \$1149.95

PRM-43085 Serial with 2K buffer \$1249.95

PRA-27081 Apple card \$39.95
PRA-27082 Apple cable \$19.95
PRA-27087 TRS-80 cable \$24.95
PRA-43081 2K hi speed serial card \$169.95
PRA-43082 Hi-res graphics ROMs 82A \$79.95
PRA-43083 Hi-graphics ROMs 83A \$79.95
PRA-43088 Tractor option for 82A \$39.95
PRA-43080 Extra ribbons pkg. of 2 \$9.95

PRINTER PAL - F.M.J. Inc.

Desk top printer stand an paper holder

PRA-99080 for MX-80, FT, Oki 82A, NEC \$24.95

PRA-99100 for MX-100, Oki 83A & 84 \$29.95

Terminals

VIDEO TERMINALS - Televideo

Inexpensive full-featured video terminals

VDT-901210 Televideo 910 \$685.00
VDT-901213 Televideo 912 \$775.00
VDT-901221 Televideo 920 \$845.00
VDT-901225 Televideo 925 \$865.00
VDT-991250 Televideo 950 \$1095.00

Dual Disk Sub-Systems

Disk Sub-Systems - Jade

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never-mar rubber feet, all necessary hardware to mount 2-8" disk drives, power supply, and fan, does not include signal cable.

Dual 8" Sub-Assembly Cabinet

END-000420 Bare cabinet \$59.95
END-000421 Cabinet kit \$225.00
END-000431 A & T \$359.95

8" Sub-Systems - Single Sided, Double Density

END-000423 Kit w/2 FD100-8Ds \$975.00
END-000424 A & T w/2 FD100-8Ds \$1175.00
END-000433 Kit w/2 SA-801Rs \$999.95
END-000434 A & T w/2 SA-801Rs \$1195.00

8" Sub-Systems - Double Sided, Double Density

END-000426 Kit w/2 DT-8s \$1224.95
END-000427 A & T w/2 DT-8s \$1424.95
END-000436 Kit w/2 SA-851Rs \$1274.95
END-000437 A & T w/2 SA-851Rs \$1474.95

Letter Quality Printers

LETTER QUALITY PRINTER - Jade

Uses standard daisy wheels and ribbon cartridges, 16 CPS bi-directional printing, semi-automatic paper loader (single sheet or fan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.

PRD-11001 Centronics parallel \$959.95

PRD-11002 RS-232C serial model \$999.95

STARWRITER F-10 - C. Itoh

New 40 CPS daisy wheel printer with full 15" carriage, uses standard Diablo print wheels and ribbons, both parallel and serial interfaces included.

PRD-22010 Starwriter F-10 \$1595.95

80 CPS LETTER QUALITY - Fujitsu

High speed daisy wheel printer with both RS-232C serial & Centronics parallel interfaces, emulates NEC 5510, Diablo 630, Qume, and will interface to the IBM Personal Computer, features include Z-80 CPU, 16K buffer (48K optional), bi-directional printing, & baud rates up to 19.2K

PRD-86100 Fujitsu with 16K \$2895.00

PRD-86200 Fujitsu with 48K \$3195.00

PRA-86000 Adjustable tractor \$190.00

Jade Bus Probe

THE BUS PROBE - Jade

Inexpensive S-100 Diagnostic Analyzer

So your computer is down. And you don't have an oscilloscope. And you don't have a front panel... You're not alone - most computers have their occasional bad days. But without diagnostic equipment such as an oscilloscope (expensive!) or a front panel (expensive!), it can be very difficult to pinpoint the problem. Even if you have an extender board with a superfast logic probe, you can't see more than one signal at a time. You're stuck, right?

Not anymore; Jade is proud to offer our cost-effective solution to the problems mentioned above: **THE BUS PROBE**.

Whether you're a hobbyist with a cantankerous kluge or a field technician with an anxious computer owner breathing down your neck, you'll find **THE BUS PROBE** speeds your repair time remarkably. Just plug in **THE BUS PROBE** and you'll be able to see all the IEEE S-100 signals in action. **THE BUS PROBE** allows you to see inputs, outputs, memory reads and writes, instruction fetches, DMA channels, vectored interrupts, 8 or 16 bit wide data transfers, plus the three bus supply voltages.

An on-board pulse generator can provide repetitive resets, interrupts, or wait states, for trouble shooting.

TSX-200B Bare board \$59.95

TSX-200K Kit \$119.95

TSX-200A A&T \$149.95

Prices may be slightly higher at our retail locations. Please contact the store in your area for exact pricing.

5 1/4" Disk Drives

Tandon TM100-1 single-sided double-density 48 TPI
MSM-551001 \$248.95 ea 2 for \$219.95 ea

Shugart SA400L single-sided double-density 40 track
MSM-104000 \$234.95 ea 2 for \$224.95 ea

Tandon TM100-2 double-sided double-density 48 TPI
MSM-551002 \$324.95 ea 2 for \$298.95 ea

Shugart SA450 double-sided double-density 35 track
MSM-104500 \$349.95 ea 2 for \$329.95 ea

Tandon TM100-3 single-sided double-density 96 TPI
MSM-551003 \$324.95 ea 2 for \$298.95 ea

Tandon TM100-4 double-sided double-density 96 TPI
MSM-551004 \$448.95 ea 2 for \$419.95 ea

MPI B-51 single-sided double-density 40 track
MSM-155100 \$234.95 ea 2 for \$224.95 ea

MPI B-52 double-sided double-density 40 track
MSM-155200 \$344.95 ea 2 for \$334.95 ea

MPI B-91 single-sided double-density 77 track
MSM-155300 \$369.95 ea 2 for \$359.95 ea

MPI B-92 double-sided double-density 77 track
MSM-155400 \$469.95 ea 2 for \$459.95 ea

5 1/4" Cabinets with Power Supply

END-000216 Single cab w/power supply \$69.95

END-000226 Dual cab w/power supply \$94.95

8" Disk Drives

Shugart SA801R single-sided double-density
MSF-10801R \$394.95 ea 2 for \$389.95 ea

Shugart SA851R double-sided double-density
MSF-10851R \$554.95 ea 2 for \$529.95 ea

Tandon TM848-1 single-sided double-den thin-line
MSF-558481 \$424.95 ea 2 for \$394.95 ea

Tandon TM848-2 double-sided double-den thin-line
MSF-558482 \$574.95 ea 2 for \$549.95 ea

Qume DT-8 double-sided double-density
MSF-750080 \$524.95 ea 2 for \$498.95 ea

Siemens FDD 100-8 single-sided double-density
MSF-201120 \$384.95 ea 2 for \$349.95 ea

Software

PLANNER CALC - Target Software

Spread sheet (what if ?) program designed for with the user in mind, user oriented (simple english) commands allow you to quickly master this powerful software, supplied on 8" disk for use with CP/M based systems.

SFC-12251050F 8" CP/M version \$49.95

SFC-12251053F 8" Xerox \$49.95

SFC-12251053M 5 1/4" Xerox \$49.95

Place Orders Toll Free

Continental U.S. Inside California
800-421-5500 800-262-1710

For Technical Inquires or Customer Service call:

213-973-7707

JADE
Computer Products

4901 W. Rosecrans, Hawthorne, Ca 90250

TERMS of SALE: Cash, checks, credit cards, or Purchase Orders from qualified firms and institutions. **Minimum Order \$15.00.** California residents add 6% tax. Minimum shipping & handling charge \$3.00. Pricing & availability subject to change

JADE

Computer Products

3313 South Bristol St.
Santa Ana 714-549-7108

PLACE ORDERS TOLL FREE.

JADE

Computer Products

1291 West El Camino Real
Sunnyvale 415-965-7980

Continental U.S. - 800-421-5500
Inside California - 800-262-1710
Los Angeles Area - 213-973-7707

JADE

Computer Products

4344 Convoy Street
San Diego 714-268-4661

Jade Diskettes

PREMIUM DISKETTES - Jade

We proudly put our name on these high quality diskettes - guaranteed to satisfy you or your money back.

5 1/4" Diskettes, Box of Ten		
MMD-5110103	SS, SD, 01S	\$29.00
MMD-5111003	SS, SD, 10S	\$29.00
MMD-5111603	SS, SD, 16S	\$29.00
MMD-5120103	SS, DD, 01S	\$31.00
MMD-5121003	SS, DD, 010	\$31.00
MMD-5121603	SS, DD, 16S	\$31.00

8" Diskettes, Box of Ten		
MMD-8110103	SS, SD, 01S	\$31.00
MMD-8120103	SS, DD, 01S	\$39.00
MMD-8220103	DS, DD, 01S	\$48.00

BARGAIN DISKETTES

MMD-5110105	5 1/4" SS, DD, 01S	\$19.95
MMD-5220105	5 1/4" DS, DD, 01S	\$32.95
MMD-8110105	8" SS, SD, 01S	\$21.95
MMD-8120105	8" SS, DD, 01S	\$32.95
MMD-8220105	8" SS, DD, 01S	\$35.95

Video Monitors

9" AMBER or GREEN - Jade

High resolution 18 MHz compact video monitors.

VDM-901201	9" Amber phosphor	\$149.95
VDM-901301	9" Green phosphor	\$139.95

HI-RES 12" GREEN - Zenith

15 MHz bandwidth 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.
VDM-201201 List price \$189.95 \$129.95

12" GREEN SCREEN - NEC

20 MHz bandwidth, P31 phosphor ultra-high resolution video monitor with audio.
VDM-561200 List price \$289.95 \$199.95

12" COLOR MONITOR - NEC

High resolution color monitor with audio.

VDC-651212	Color monitor	\$389.95
NEC-1202D	RGB color monitor	\$999.95

COLOR MONITORS - Amdek

Reasonably priced color video monitors.

VDC-80130	13" Color I	\$379.95
VDC-801320	13" Color II	\$894.95
IOV-2300A	DVM board for Apple	\$199.95

COLOR TELEVISION - Bohsei

High quality inexpensive color televisions with excellent color, brilliance, & reception, both UHF & VHF, perfect for Apple II, Atari, Commodore VIC-20, or TRS color computer.
VDC-991300 13" Color receiver \$239.95
VDC-991900 19" Color receiver \$299.95

EPROM Erasers

ULTRA-VIOLET EPROM ERASERS

Inexpensive erasers for industry or home.

XME-3100A	Spectronics w/o timer	\$69.50
XME-3101A	Spectronics with timer	\$94.50
XME-3200A	Economy model	\$39.95

Power Strips

ISOBAR - GSC

Isolates & protects your valuable equipment from high voltage spikes & AC line noise, inductive isolated ground, 15 amp circuit breaker, U.L. listed

EME-115103	3 socket	\$39.50
EME-115105	4 socket	\$49.50
EME-115100	8 socket	\$54.50
EME-115110	9 socket rackmount	\$74.50

Single User System

THREE BOARD SET - SD Systems

4 MHz Z-80A CPU, 64K RAM (optional 256K), serial I/O port, parallel I/O port, double density disk controller, CP/M 2.2 & manual set, system monitor, control & diagnostic software. Includes SBC-200, 64K ExpandoRAM II, Versafloppy II, & CP/M 2.2 - all boards are assembled & tested.
Board set with 64K of RAM \$1095.00
Board set with 256K of RAM \$1295.00

Apple II Accessories

16K RAM CARD - for Apple II

Expand your Apple to 64K, 1 year warranty

MEX-16700A Save \$125.00 !!! \$74.95

Z-80 SOFTCARD - MicroSoft

Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M 2.2, & Basic 80.

CPX-30800A A & T with software \$299.95

8" DISK CONTROLLER - Vista

New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CP/M 2.2, Shugart & Qume compatible
IOD-2700A A & T \$499.95

2 MEGABYTES for Apple II

Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

1 MegaByte Package Kit	\$1495.00
1 MegaByte Package A & T	\$1695.00
2 MegaByte Package Kit	\$1795.00
2 MegaByte Package A & T	\$1995.95

A2 DISK DRIVE - Micro Sci

Inexpensive direct replacement for Apple Disk II, works with Apple II controller as first or second drive.

MSM-123101 Micro Sci A2	\$379.95
MSM-123101C A2 with contrlr	\$459.95

VISION 80 - Vista Computer

80 column x 24 line video card for Apple II, 128 ASCII characters, upper and lower case, 9 x 10 dot matrix with 3 dot descenders, standard data media terminal control codes, CP/M Pascal & Fortran compatible, 50/60 Hz
IOV-2400A Vista Vision 80 \$299.95

CPS MULTICARD - Mtn. Computer

Three cards in one! Real time clock/calendar, serial interface, & parallel interface - all on one card.
IOX-2300A A & T \$179.95

APPLE-CAT - Novation

Software selectable 1200 or 300 baud, direct connect, auto-answer/auto-dial, auxiliary 3-wire RS232C serial port for printer.

IOM-5232A Save \$50.00!!! \$325.95

JOYSTICK - T G Products

A better joystick for your Apple II

SYA-1512A A & T \$49.95

Modems

SIGNALMAN - Anchor

Direct-connect automatic answer/originate selection, 300 Baud full duplex, Bell 103, includes RS-232 cable

IOM-5600A Signalman \$98.50

SMARTMODEM - Hayes

Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable

IOM-5400A Smartmodem	\$248.95
IOK-1500A Hayes Chronograph	\$218.95
IOM-2010A Micromodem II	\$328.95
IOM-1100A Micromodem 100	\$368.95

Single Board Computer

SUPERQUAD - Adv. Micro Digital

Single board, standard size S-100 computer system, 4 MHz Z-80A, single or double density disk controller for 5 1/4" or 8" drives, 64K RAM, extended addressing, up to 4K of EPROM, 2 serial & 2 parallel I/O ports, real time interrupt clock, CP/M compatible.

CPC-30800A A & T	\$794.95
IOX-30800A Serial I/O adapter	\$29.95

Z-80 STARTER KIT - SD Systems

Complete Z-80 microcomputer with RAM, ROM, I/O, keyboard, display, kludge area, manual, & workbook.

CPS-30100K Kit with workbook	\$299.95
CPS-30100A A & T with workbook	\$469.95

AIM-65 - Rockwell International

Complete 6502 microcomputer with alphanumeric display, printer, keyboard, & instruction manual.

CPK-50165A 1K AIM-65	\$424.95
CPK-50465A 4K AIM-65	\$474.95
SFK-74600008E 8K Basic ROM	\$64.95
SFK-64600004E 4K assembler ROM	\$43.95
SFK-74600020E PL/65 ROM	\$84.95
SFK-74600010E Forth ROM	\$64.95
SFK-74600030E Instant Pascal	\$99.95
PSX-030A Power supply	\$64.95
ENX-000002 Enclosure	\$54.95

4K AIM-65, 8K Basic, power supply, & enclosure

Special Package Price \$649.95

S-100 EPROM Boards

PB-1 - SSM Microcomputer

2708, 2716 EPROM board with on-board programmer.

MEM-99510K Kit with manual	\$154.95
MEM-99510A A & T with manual	\$219.95

PROM-100 - SD Systems

2708, 2716, 2732 EPROM programmer with software.

MEM-99520K Kit with software	\$189.95
MEM-99520A A & T with software	\$249.95

EPROM BOARD - Jade

16K or 32K uses 2708 or 2716 EPROMs, 1K boundary.

MEM-16230K Kit w/o EPROMs	\$79.95
MEM-16230A A & T w/o EPROMs	\$119.95

S-100 Video Boards

SPECTRUM COLOR - CompuPro

Full-function color graphics board, up to 8 colors, 256 x 192 graphics, parallel I/O port, 8K RAM.

IOV-1870A A & T	\$348.95
IOV-1870C CSC	\$398.95

MICROANGELO - Scion

Ultra-high-resolution 512 x 480, 256 color or black & white S-100 video board

IOV-1500A A & T \$999.95

S-100 MotherBoards

ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard
6 Slot (5 1/4" x 8 1/2")

MBS-061B Bare board	\$19.95
MBS-061K Kit	\$39.95
MBS-061A A & T	\$59.95

12 Slot (9 1/4" x 8 1/2")

MBS-121B Bare board	\$29.95
MBS-121K Kit	\$69.95
MBS-121A A & T	\$99.95

18 Slot (14 1/2" x 8 1/2")

MBS-181B Bare board	\$49.95
MBS-181K Kit	\$99.95
MBS-181A A & T	\$139.95

ACTIVE TERMINATOR - CompuPro

A true mother's helper.

TSX-100A A & T \$59.45

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

Circle 48 on Reader Service card

JADE

Computer Products

13440 South Hawthorne Blvd.
Hawthorne 213-973-7330

PLACE ORDERS TOLL FREE.

JADE

Computer Products

21800 Ventura Blvd
Woodland Hills 213-716-6120

Continental U.S. - 800-421-5500
Inside California - 800-262-1710
Los Angeles Area - 213-973-7707

JADE

Computer Products

4950 Bellline Road
Dallas 214-458-2782

S-100 CPU Boards

8085/8086 - CompuPro

Both 8 & 16 bit CPUs, standard 8 bit S-100 bus, up to 8 MHz, accesses 16 Megabytes of memory.

CPU-20510A 6 MHz A & T \$398.95
CPU-20510C 6/8 MHz CSC \$497.95

8086/8087 - CompuPro

16 bit, 8 or 10 MHz 8086 CPU with provisions for 8087 & 80130.

CPU-70520A 8 MHz 8086 A & T \$624.95
CPU-70520C 8 MHz 8086 CSC \$764.95
CPU-70530A with 8087 A & T \$1224.95
CPU-70530C with 8087 CSC \$1455.95

CPU-Z - CompuPro

2/4 MHz Z80A CPU, 24 bit addressing.

CPU-30500A 2/4 MHz A & T \$279.95
CPU-30500C 3/6 MHz CSC \$374.95

SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included.

CPC-30200A A & T \$399.95

THE BIG Z - Jade

2 or 4 MHz switchable Z-80 CPU board with serial I/O, accommodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600.

CPU-30201B Bare board w/manual \$35.00
CPU-30201K Kit with manual \$139.95
CPU-30210A A & T with manual \$199.95

CB-2 - SSM Microcomputer

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.

CPU-30300K Kit with manual \$229.95
CPU-30300A A & T with manual \$274.95

2810 Z-80 CPU - C.C.S.

2 or 4 MHz Z-80 CPU with serial I/O port & on-board monitor PROM, front panel compatible.

CPU-30400A A & T with PROM \$289.95

2820 Z-80 DMA CPU - C.C.S.

4 MHz Z-80 CPU board with 2 serial I/O ports & Centronics parallel I/O port, separate data & status ports, DMA daisy chain compatible.

CPU-30420A A & T with manual \$569.95

S-100 Disk Controllers

DISK 1 - CompuPro

8" or 5 1/4" DMA disk controller, single or double density, single or double sided, 10 MHz.

IOD-1810A A & T \$449.95
IOD-1810C CSC \$554.95
SFC-52506580F 8" CP/M 2.2 for Z-80 \$174.95
SFC-52506586F 8" CP/M 2.2 for 8086 \$299.95
SFO-54158000F Oasis single user \$499.95
SFO-54158002F Oasis multi-user \$849.95

DOUBLE D - Jade

High reliability double density disk controller with on-board Z-80A, auxiliary printer port, IEEE S-100, can function in multi-user interrupt driven bus.

IOD-1200B Bare board & h/wr man \$59.95
IOD-1200K Kit w/h/wr & s/wr man \$299.95
IOD-1200A A & T w/h/wr & s/wr man \$359.95
SFC-59002001F CP/M 2.2 with Double D \$99.95

VERSAFLOPPY II - SD Systems

Double density disk controller for any combination of 5 1/4" and 8" single or double sided, analog phase-locked loop data separator, vectored interrupts, CP/M 2.2 & Oasis compatible, control/diagnostic software PROM included.

IOD-1160A A & T with PROM \$359.95
SFC-55009047F CP/M 2.2 with VF II \$99.95

2242 DISK CONTROLLER - C.C.S.

5 1/4" or 8" double density disk controller with on-board boot loader ROM, free CP/M 2.2 & manual set.

IOD-1300A A & T with CP/M 2.2 \$399.95

S-100 Memory Boards

256K RAMDISK - SD Systems

ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, functions as ultra-high speed disk drive when used with optional RAMDISK software, compatible with CP/M, MP/M, Oasis, Cromemco, & most other Z-80 based systems.

MEM-65064A 64K A & T \$474.95
MEM-65128A 128K A & T \$574.95
MEM-65192A 192K A & T \$674.95
MEM-65256A 256K A & T \$774.95
SFC-55009000F RAMDISK s/wr CP/M 2.2 \$24.95

128K RAM 21 - CompuPro

128K x 8 bit or 64K x 16 bit static RAM board, 12 MHz, 24 bit addressing.

MEM-12810A 32K A & T \$1609.95
MEM-12810C CSC \$1794.95

64K EXPANDORAM II - SD Systems

Expandable RAM board from 16K to 64K using 4116 RAM chips.

MEM-16630A 16K A & T \$344.95
MEM-32631A 32K A & T \$364.95
MEM-48632A 48K A & T \$384.95
MEM-64633A 64K A & T \$399.95

64K RAM 17 - CompuPro

64K CMOS static RAM board, 10 MHz, low power less than 4 watts, DMA compatible, 24 bit addressing.

MEM-64180A 64K A & T \$549.95
MEM-64180C 64K CSC \$698.95

64K RAM 16 - CompuPro

32K x 16 bit or 64K x 8 bit low power static RAM board, 10 MHz, 24 bit addressing.

MEM-32180A RAM 16 A & T \$598.95
MEM-32180C RAM 16 CSC \$698.95

64K STATIC RAM - SSM

IEEE 696/S-100 standard, up to 6MHz/8 Bit, 12MHz/16 Bit, 24 Bit extended addressing, disable-able in 2K increments

MEM-64300A A & T \$749.95

64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4 to 16K banks up to 8 MHz.

MEM-64400A 64K A & T \$594.95

2065 64K RAM - C.C.S.

4 MHz bank port/bank byte selectable, extended addressing, 16K bank selectable, front panel compatible.

MEM-64585A 64K A & T \$349.95

2066 64K RAM - C.C.S.

64K RAM board with bank and block select switching functions for Cromemco Cromix & Alpha Micro.

MEM-64566A 64K A & T \$424.95

MEMORY BANK - Jade

4 MHz S-100 bank selectable expandable to 64K.

MEM-99730B Bare board w/manual \$49.95
MEM-99730K Kit with no RAM \$179.95
MEM-32731K 32K kit \$199.95
MEM-64733K 64K kit \$249.95
Assembled & Tested add \$50.00

32K RAM 20 - CompuPro

32K static RAM, up to 10 MHz, disable-able in 4K banks, bank select or 24 bit addressing.

MEM-16180A 16K A & T \$259.95
MEM-16180C 16K CSC \$324.95
MEM-24180A 24K A & T \$324.95
MEM-24180C 24K CSC \$384.95
MEM-32185A 32K A & T \$384.95
MEM-32185C 32K CSC \$449.95

16K STATIC RAM - Mem Merchant

4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.

MEM-16171A 16K A & T \$154.95

S-100 I/O Boards

SYSTEM SUPPORT 1 - CompuPro

Real time clock, three 16 bit interval timers, dual interrupt controllers(15 levels), up to 4K EPROM/RAM, RS-232C serial channel, provision for 9511A/9512 math chip.

IOX-1850A SS1 A & T \$359.95
IOX-1850C SS1 CSC \$459.95
IOX-1855A with 9511 A & T \$554.95
IOX-1855C with 9511 CSC \$654.95
IOX-1860A with 9512 A & T \$554.95
IOX-1860C with 9512 CSC \$654.95

INTERFACER 1 - CompuPro

2 serial I/O ports 50-19.2K baud.

IOI-1810A A & T \$218.95
IOI-1810C CSC \$288.95

INTERFACER 2 - CompuPro

3 parallel, 1 serial, & interrupt timer.

IOI-1820A A & T \$218.95
IOI-1820C CSC \$288.95

INTERFACER 3 - CompuPro

5 or 8 channel serial I/O board for interrupt driven multi-user systems up to 250K baud.

IOI-1835A 5 port A & T \$558.95
IOI-1835C 5 port CSC \$628.95
IOI-1838A 8 port A & T \$628.95
IOI-1838C 8 port CSC \$749.95

INTERFACER 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel.

IOI-1840A A & T \$314.95
IOI-1840C CSC \$414.95

MPX - CompuPro

Multi-user I/O multiplexer & interrupt controller with on-board 8085A-2 CPU & 4K or 16K of RAM.

IOI-1875A 4K MPX A & T \$444.95
IOI-1875C 4K MPX CSC \$534.95
IOI-1880A 16K MPX A & T \$584.95
IOI-1880C 16K MPX CSC \$674.95

I/O-4 - SSM Microcomputer

2 serial I/O ports plus 2 parallel I/O ports.

IOI-1010B Bare board w/manual \$35.00
IOI-1010K Kit with manual \$179.95
IOI-1010A A & T with manual \$249.95

I/O-5 - SSM Microcomputer

Two serial & 3 parallel I/O ports, 110-19.2K Baud

IOI-1015A A & T \$289.95

I/O-8 - SSM Microcomputer

Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems

IOI-1018A A & T \$469.95

MPC-4 - SD Systems

Intelligent 4-port serial I/O card, on-board Z-80A, 2K RAM, 4K PROM area, on-board firmware, fully buffered, vectored interrupts, four CTC channels, add to SD Board set for powerful multi-user system

IOI-1504A A & T w/software \$495.00

2719 2 SER & 2 PAR - C.C.S.

Two RS-232C serial I/O ports plus two 8 bit parallel I/O ports.

IOI-1080A A & T with manual \$349.95

2710 4 PORT SERIAL - C.C.S.

Four RS-232C serial I/O ports with full handshaking.

IOI-1060A A & T with manual \$319.95

2830 6 PORT SERIAL - C.C.S.

Six asynchronous RS-232C serial I/O ports with programmable baud rates.

IOI-1040A A & T with manual \$529.95

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

Circle 48 on Reader Service card.

Mini Stereo AM/FM Receiver

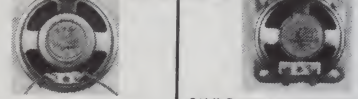
WITH HEADPHONES — For Joggers, Cyclists, Skaters & Sports Events



FEATURES: Lightweight headphones. Left/right balance control. Full fidelity stereo sound. Additional black soft carrying case & shoulder strap. Belt clip (hands free). Operates on 3 AA cell batteries (not incl.). Compact size: 3 1/2" x 4 7/8" x 1". Wt. 6 oz.

Model 2830 List Price \$89.95 \$34.95

SPEAKERS



2 1/2" Round — 8 Ohm
25 Watt (4 Leads)
Size: 2 1/4" x 1 1/4"

2 1/2" Square — 16 Ohm
25 Watt (4 mount holes)
Large Ceramic Magnet
Size: 2 1/4" x 2 1/4"

Part No. Price
A0201 \$1.25 or 2/1.98

National Semiconductor

RAM SALE

STATIC RAMS

MM2114N-2 4K (200NS) \$2.49 each
(8 EACH \$16.95/lot) (100 EACH \$195.95/lot)

MM2114N-2L 4K (200NS) Low Power \$2.95 each
(8 EACH \$19.50/lot) (100 EACH \$225.00/lot)

MM2147N 4K (70NS) \$4.95 each
(8 EACH \$34.95/lot) (100 EACH \$419.95/lot)

MM6116P-4 16K (200NS) \$9.95 each
(8 EACH \$69.95/lot) (100 EACH \$795.00/lot)

DYNAMIC RAMS

MM4164N-20 64K (200NS) \$9.95 each
(8 EACH \$69.95/lot) (100 EACH \$795.00/lot)

MM5261N 1K (300NS) \$1.95 each
MM5262N 2K (365NS) \$1.95 each

MM5260N-2 16K (150NS) 4116 \$2.95 each
(8 EACH \$19.50/lot) (100 EACH \$225.00/lot)

MM5260N-4 16K (250NS) 4116 \$1.95 each
(8 EACH \$14.95/lot) (100 EACH \$175.00/lot)

EPROM Erasing Lamp



- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips

UVS-11EL Replacement Bulb \$16.95

UVS-11E \$79.95

JOYSTICKS



JS-5K \$5.25
JS-100K \$4.95
JS-150K \$4.75
JVC-40 \$4.95

5 1/4" Mini-Floppy Disc Drive

For TRS-80 MODEL I, II (Industry Standard)
Features single or double density. Recording mode: FM single, MFM double density. Power: 12VDC (±0.6V) 1.6 amps max. 5VDC (±0.25V) 0.8 amps max. Unit as pic-tured at left (does not incl. case, power supply or cables). 30-page data book included. Weighs 3 1/2 pounds. Size: 5 1/4" x 8" x 3 1/4"

Part No. Limited Quantity Price
FD200 \$179.95
Single-sided, 40 tracks, 250K bytes capacity

FD250 \$199.95
Double-sided, 35 tracks, 438K bytes capacity

JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general all-purpose variable power supply.

FEATURES:

- Adjustable regulated power supplies, pos. and neg. 12VDC to 15VDC.
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators
- With thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120V AC input
- Size: 3 1/2" w x 5 1/16" L x 2 1/4" H

JE215 Adj. Dual Power Supply Kit (as shown) \$24.95

(Picture not shown but similar in construction to above)
JE200 Reg. Power Supply Kit (5VDC, 1 amp) \$14.95
JE205 Adapter Bld. (to JE200) 5.95 & 12V \$12.95
JE210 Ver. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. \$19.95

MICROPROCESSOR COMPONENTS

8080A/8080A SUPPORT DEVICES

INS5800A	CPU	4.95
DP212	8-Bit Input/Output	1.35
DP214	Priority Interrupt Control	1.35
DP216	8-Bit Directional Bus Driver	1.35
DP220	Clock Generator/Driver	1.35
DP224	Bus Driver	1.35
DP228	System Controller/Bus Driver	1.35
DP232	System Controller	1.35
INS5403	I/O Expander for 48 Series	4.95
INS5405	Asynchronous Comm. Element	4.95
DP251	Prog. Comm. I/O (USART)	4.95
DP253	Prog. Interval Timer	1.35
DP255	Prog. Peripheral I/O (PPI)	1.35
DP257	Prog. DMA Control	1.35
DP259	Prog. Interrupt Control	1.35
DP261	Prog. CRT Controller	1.35
DP279	Prog. Keyboard/Display Interface	3.95
DP283	System Timing Element	1.35
DP300	8-Bit Bi-Directional Receiver	1.35
DP307	8-Bit Bi-Directional Receiver	1.35
DP308	8-Bit Bi-Directional Receiver	1.35
DP310	Dual Latched Peripheral Driver	1.35
DP311	Dual Latched Peripheral Driver	1.35

6800/6800A SUPPORT DEVICES

MC6800	MPU	7.95
MC6802CP	MPU with Clock and RAM	14.95
MC6801AP	128-Bit Static RAM	4.95
MC6821	Peripheral Interf. Adapt. (MC6820)	7.95
MC6826	Priority Interrupt Controller	1.35
MC6831A	1024-Bit ROM (MC6830-B)	14.95
MC6850	Asynchronous Comm. Adapter	6.95
MC6860	Synchronous Serial Data Adapter	6.95
MC6865	6400bps Digital Modem	14.95
MC6862	2400bps Modulator	12.95
MC6863	Dual 3-State Bus Trans. (MC6878)	2.95
MC6864	8400bps Digital Modem	14.95

MICROPROCESSOR CHIPS

Z80 (780C)	CPU (MK3800N) (2MHz)	11.95
Z80A (780-1)	CPU (MK3800N) (4MHz)	19.95
CDP1802	MPU	14.95
INS4200A	CPU-4 Bit Slice (Com. Temp. Grade)	19.95
INS4200B	MPU w/Clock (8K Bytes Memory)	11.95
INS4200N-4	MPU-8 Bit (6MHz)	7.95
INS4200N-4	CPU-Sel. Chip 8-Bit (128bytes RAM)	14.95
INS4200N-4	CPU-128 Bytes RAM	24.95
INS4200N-4	CPU-16 Bytes RAM	24.95
INS4200N-4	CPU w/Basic Micro Interpreter	1.95
7808	CPU	1.95
TM5900/L	MPU-16 Bit	39.95

1173AN-1 30 Time Musical MPU Chip 8.95

SHIFT REGISTERS

MM550H	Dual 8-Bit Dynamic	3.00
MM550H	Dual 16-Bit Dynamic	3.00
MM550H	Dual 32-Bit Dynamic	3.00
MM550H	Dual 64-Bit Accumulator	3.00
MM550H	256-Bit Dynamic	2.95
MM550H	1024-Bit Dynamic/Accumulator	1.95
MM550H	512-Bit Dynamic	1.95
MM550H	Dual 8-Bit	9.95
MM550H	Dual 16-Bit	9.95
MM550H	Dual 32-Bit	9.95
MM550H	Dual 64-Bit	9.95
MM550H	Dual 128-Bit	9.95
MM550H	Dual 256-Bit	9.95
MM550H	Dual 512-Bit	9.95
MM550H	Dual 1024-Bit	9.95
MM550H	Dual 2048-Bit	9.95

DATA ACQUISITION

DC10	Mostek DC/DC Convert. 45V to 4V	29.95
MC170P	Floppy Disc Read AMP. 45V	4.95
MC170P	8-Bit D/A Converter (DAC0801CN)	4.95
MC170P	8-Bit D/A Converter (DAC0801CN)	4.95
AF130-1CN	Universal Active Filter 2.5K	5.95
AF130-1CN	Touch Tone Low Band Filter	1.95
AF130-1CN	Touch Tone High Band Filter	1.95
LM32C	Super Gain Op Amp	1.95
LM32C	Constant Current Source	1.95
LM32C	Temperature Transducer	1.95
LF35AN	JFET Input Op Amp	1.10
LF35AN	Sample & Hold Amplifier	3.95
LM399H	Temp. Comp. Prec. Ref. (10ppm/°C)	4.95
ADC0801CN	8-Bit A/D Converter (1.5MS)	3.95
DAC0801CN	8-Bit D/A Converter (0.2% Lin.)	2.25

POWER SUPPLY — 5VDC @ 1 AMP REGULATED Transaction Tech

Output: +5VDC @ 1 amp, +30VDC Reg. Input: 115VAC 60Hz. Two-tone (black/beige) self-enclosed case, 6 foot, 3 conductor black power cord. Size: 6 1/4" W x 7" D x 2 1/4" H — Wt. 3 lbs.

Part No. PS51194 \$19.95 each

POWER SUPPLY — 5VDC @ 1 AMP REGULATED 8 Industries

Output: +5VDC @ 1 amp, +36-42VDC Adjusted, 400mA or less, 30VAC (Isolated) @ 1.5 amp. Input: 115VAC 60Hz. Circuit breaker re-set button. Black self-enclosed case with 4 rubber feet, 6 foot, 3 conductor black power cord. On/off switch. Size: 6 1/4" W x 7 1/4" D x 3 1/4" H — Wt. 7 lbs.

Part No. PS407D \$24.95 each

POWER PAC Heavy Duty Multi-Voltage Power Supply — 5VDC, 12VDC & 24VDC

Output: +5VDC @ 30A, +12VDC @ 2A, +24VDC @ 4A and +24VDC @ 3A. Input: 115VAC, 7A, 220VAC, 3.5A. Regulation: ±.15% line and load combined. Ripple: 10mV peak to peak (30V RMS). Overvoltage protection: 5V, +12V, +24V. Overcurrent protection included. Size: 15 1/2" L x 6" H x 1 1/2" D — Wt. 40 lbs.

Part No. 285-016 \$119.95 each

POWER SUPPLY — 5VDC @ 1 AMP REGULATED Transaction Tech

Output: +5VDC @ 1 amp, +30VDC Reg. Input: 115VAC 60Hz. Two-tone (black/beige) self-enclosed case, 6 foot, 3 conductor black power cord. Size: 6 1/4" W x 7" D x 2 1/4" H — Wt. 3 lbs.

Part No. PS51194 \$19.95 each

POWER SUPPLY — 5VDC @ 1 AMP REGULATED 8 Industries

Output: +5VDC @ 1 amp, +36-42VDC Adjusted, 400mA or less, 30VAC (Isolated) @ 1.5 amp. Input: 115VAC 60Hz. Circuit breaker re-set button. Black self-enclosed case with 4 rubber feet, 6 foot, 3 conductor black power cord. On/off switch. Size: 6 1/4" W x 7 1/4" D x 3 1/4" H — Wt. 7 lbs.

Part No. PS407D \$24.95 each

POWER PAC Heavy Duty Multi-Voltage Power Supply — 5VDC, 12VDC & 24VDC

Output: +5VDC @ 30A, +12VDC @ 2A, +24VDC @ 4A and +24VDC @ 3A. Input: 115VAC, 7A, 220VAC, 3.5A. Regulation: ±.15% line and load combined. Ripple: 10mV peak to peak (30V RMS). Overvoltage protection: 5V, +12V, +24V. Overcurrent protection included. Size: 15 1/2" L x 6" H x 1 1/2" D — Wt. 40 lbs.

Part No. 285-016 \$119.95 each

POWER SUPPLY — 5VDC @ 1 AMP REGULATED Transaction Tech

Output: +5VDC @ 1 amp, +30VDC Reg. Input: 115VAC 60Hz. Two-tone (black/beige) self-enclosed case, 6 foot, 3 conductor black power cord. Size: 6 1/4" W x 7" D x 2 1/4" H — Wt. 3 lbs.

Part No. PS51194 \$19.95 each

POWER SUPPLY — 5VDC @ 1 AMP REGULATED 8 Industries

Output: +5VDC @ 1 amp, +36-42VDC Adjusted, 400mA or less, 30VAC (Isolated) @ 1.5 amp. Input: 115VAC 60Hz. Circuit breaker re-set button. Black self-enclosed case with 4 rubber feet, 6 foot, 3 conductor black power cord. On/off switch. Size: 6 1/4" W x 7 1/4" D x 3 1/4" H — Wt. 7 lbs.

Part No. PS407D \$24.95 each

POWER PAC Heavy Duty Multi-Voltage Power Supply — 5VDC, 12VDC & 24VDC

Output: +5VDC @ 30A, +12VDC @ 2A, +24VDC @ 4A and +24VDC @ 3A. Input: 115VAC, 7A, 220VAC, 3.5A. Regulation: ±.15% line and load combined. Ripple: 10mV peak to peak (30V RMS). Overvoltage protection: 5V, +12V, +24V. Overcurrent protection included. Size: 15 1/2" L x 6" H x 1 1/2" D — Wt. 40 lbs.

Part No. 285-016 \$119.95 each

BOOKS

30001	National Semiconductor — Interall — Intel	66.95
30002	National CMOS Data Book (640 pages) 74C, CD4000, and A/D Converter	66.95
30003	National Linear Data Book (704 pages) 74C, CD4000, and A/D Converter	66.95
30004	National Linear Data Book (704 pages) 74C, CD4000, and A/D Converter	66.95
30005	National Series 80 — Board Level Computer (224 pages)	66.95
30006	National TTL Logic Data Book (624 pages) 7400, LS, L, H, S, and DM8000 Series	66.95

30006 Above (3) 30001, 3.5 as set \$24.95/lot

010400 Intel Component Data Catalog \$14.95

Full data sheets for Intel's products incl. memory devices, microprocessors, peripheral 5 input, mil. products (1328 pages)

206610 Intel Peripheral Design Handbook \$9.95

Full data sheets, appl. notes for Intel peripheral device components (564 pages)

AC and DC Wall Transformers

Part No. DC6912
With Universal Plug
9V Battery Snap
Selective voltages: 6.3, 12VDC.
Polarity selection (+/-), six-foot line from adapter to plug — six-foot line from adapter to battery snap. 120V/60Hz, 300mA.

Part No. Input Output Price

AC 250	117V/60Hz	12VAC 250mA	\$3.95
AC 500	117V/60Hz	12VAC 500mA	\$4.95
AC1000	117V/60Hz	12VAC 1 amp	\$5.95
AC1700	117V/60Hz	12VAC 1.7 amp	\$3.95
DC 800	120V/60Hz	8VDC 800mA (batt. charger)	\$1.95
DC6912 (above)	120V/60Hz	6.3, 12VDC 300mA	\$9.95
DC900	117V/60Hz	9VDC 300mA	\$3.95
DC1200	120V/60Hz	12VDC 300mA	\$2.95

CONNECTORS

DB25P	D-Subminiature Plug	\$2.95
DB25S	D-Subminiature Socket	\$3.50
D20418-2	Screw Lock Hdw. (2) DB25S/P	2/\$9.99
MS51226	Conn. for DB25S/P	\$1.75
22/44SE	P.C. Edge (22/44 Pin)	\$2.95
UG69/U	BNC Plug	\$1.79
UG89/U	BNC Jack	\$3.79
UG175/U	UHF Adapter	\$4.49
SO239	UHF Panel Recp.	\$1.29
PL258	UHF Adapter	\$1.60
UL156	UHF Plug	\$1.60
UG260/U	BNC Plug	\$1.79
UG109/U	BNC Bulkhead Recp.	\$1.29

TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K

Kit comes complete with:

• 8 ea. MM5290 (UPD416/4116) 16K Dyn. Ram ("ns)

• Documentation for conversion

TRS-16K2 *150ns \$19.95

TRS-16K3 *200ns \$16.95

TRS-16K4 *250ns \$14.95

Mostek DC/DC Converter

+5 VOLTS TO -9 VOLTS

Input: +5V. Output: -9V (regulated) @ 30mA.

Printed circuit module.

DC10 \$2.95 ea. or 2/\$4.95

JE610 ASCII Encoded Keyboard Kit

The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and -12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-definable keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3 1/4" x 14 1/4" x 6 1/4" D.

JE610/DTE-AK (as pictured above) \$124.95

JE610 Kit & Components (no case) \$79.95

D62 62-Key Keyboard (Keyboard only) \$34.95

DTE-AK (case only — 3 1/4" x 14 1/4" x 6 1/4" D) \$49.95

JE212 — Negative 12VDC Adapter Board Kit

For JE610 ASCII KEYBOARD Kit

Provides -12VDC from incoming 5VDC \$9.95

JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT 19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 8 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3 1/4" x 8 1/4" x 6 1/4" D.

JE600/DTE-HK (as pictured above) \$99.95

JE600 Kit & Components (no case) \$59.95

K19 19-Key Keyboard (Keyboard only) \$14.95

DTE-HK (case only — 3 1/4" x 8 1/4" x 6 1/4" D) \$44.95

JE212 — Negative 1

WE WILL NOT BE UNDERSOLD

SOFTWARE

MICROPRO	
Wordstar	\$319
Mailmerge	\$109
Wordstar/Mailmerge	\$419
Customization Notes	\$399
MICROSOFT	
Basic Interpreter	\$349
Basic Compiler	\$389
Fortran 80	\$499
Cobol 80	\$695
DATA BASE	
FMS80	\$595
dBase II	\$599
MISCELLANEOUS	
Computer Station	
Graphics Dump	\$39.95
SuperCalc®	\$269
Personal Filing System	\$75
PFS Report Writer	\$75
INFORMATION UNLIMITED for the	
IBM Personal Computer	
Easywriter II	NEW! \$299
Easyspeller II	NEW! \$149
Easyfiler	NEW! \$329

APPLE SOFTWARE

MICROPRO	
Wordstar	\$269
MailMerge	\$99
Wordstar/Mailmerge	\$349
Spellstar	\$149
VISICORP	
VisiCalc™	\$199
VisiTerm™	\$79
VisiDex™	\$199
VisiPlot™	\$169
VisiFile™	\$199
VisiSchedule™	\$259
VisiTrend/Plot™	\$239
VisiPac™	\$539
MISCELLANEOUS	
Micro Courier	\$219
Screenwriter II	\$129
ENTERTAINMENT	
Wizard and Princess	\$29
Raster Blaster	\$26
Space Eggs	\$26
Twerps	\$28
Borg	\$28
Castle Wolfenstein	\$27
Beer Run	\$28
Epoch	\$32
Sneakers	\$27
Midnight Magic	\$32
Wizardry	\$45
Time Zone	\$79
Ghost Hunter	\$29
Jawbreaker	\$20

TERMINALS

ADDS Viewpoint	\$569
Zenith Z-19	\$689
Televideo 910	\$595
Televideo 920	\$769
Televideo 925	\$779
Televideo 950	\$969

For fast delivery, send certified checks, money orders, or call to arrange direct bank wire transfers. Personal or company checks require one to three weeks to clear. All prices are **mail order only** and are subject to change without notice. **Call for shipping charges.**

APPLE ACCESSORIES

Z-80 Card by Microsoft	\$319
16K Card by Microsoft	\$159
32K Card by Saturn	\$199
Keyboard Enhancer II by Videx	\$125
Videoterm by Videx	\$259
Game Paddles by TG	\$49
Joystick by TG	\$49
Numeric Keypad by	
Keyboard Co.	\$139
Sup-R-Mod	\$25
Sup-R-Fan	\$39
ALF 9 Voice Board	\$159
Station II by Trace Systems	\$119
APPLE INTERFACE CARDS BY CCS	
Parallel #7720	\$119
Centronics #7728	\$115
Serial Asynch. #7710	\$139
Serial Synch. #7712	\$149
ADVANCED LOGIC	NEW!
Add-Ram 16K Card	NEW! \$119
Z-Card CP/M for the	
Apple II	NEW! \$225
Smartterm 80 Column Board	
with Softswitch	NEW! \$249
The Synergizer	
All of the above plus	
"The CP/M Handbook"	NEW! \$599

DISK DRIVES

CCI 100 for the TRS-80 Model 1	
5 1/4 40 track	\$299
CCI 189 for the Zenith Z-89	
5 1/4 40 track	\$379
Corvus 5M with Mirror	\$3089
Corvus 10M with Mirror	\$4489
Corvus 20M with Mirror	\$5429
Corvus Interfaces	CALL
RANA SYSTEMS add-on Disc Drive	
for the Apple II	NEW!
Elite One 40 Track	NEW! \$419
Elite Controller	NEW! \$119

DISKETTES

Maxell 5 1/4 single side	\$39
Maxell 8 single side	\$49
Maxell 5 1/4 double side	\$45
Maxell 8 double side	\$55
BASF 5 1/4	\$26.95
BASF 8	\$36
Verbatim 5 1/4	\$26.95
Verbatim 8	\$36
Wabash 5 1/4	NEW! \$34.95
Wabash 8	NEW! \$39.95

TELECOMMUNICATIONS

Prentice Star Modem	\$129
Novation Cat Modem	\$139
Novation D-Cat	\$149
Novation Auto-Cat	\$199
Novation Apple-Cat	\$299
Hayes Smart Modem	\$249
Hayes Micro-Modem	\$295
Hayes Chronograph	\$225

Dealer (National/International) Inquiries Invited.
Send for FREE catalogue

COMPUTERS

ATARI (Call for prices on the complete Atari line)	
Atari 800	\$699
Atari 400	\$369
CALIFORNIA COMPUTER SYSTEMS	
Mainframe 220	\$485
64K Ram 2065	\$569
Z-80 CPU 2810A	\$265
Floppy Controller 2422a	\$359
ZENITH (Call for prices on the complete Zenith line)	
Zenith Z-89 48K	CALL
Zenith Z-90 64K	CALL
COMMODORE VIC-20	NEW! \$239
CASIO FX702 Pocket Computer	NEW! \$189

SPECIAL OF THE MONTH
SANYO MBC 1000
64K COMPUTER \$1595

PRINTERS

NEC 7710 Serial	\$2395
NEC 7720 KSR	\$2749
NEC 7730 Parallel	\$2395
NEC 3510 Serial	\$1850
NEC 3530 Parallel	\$1850
NEC 8023 Dot Matrix 100cps	\$559
Olivetti DY211 Letter Quality Daisy Wheel Printer	\$1595
Parallel Only	\$1395
Epson MX-80	CALL
Epson MX-80FT	CALL
Epson MX-100	CALL
IDS 560	CALL
IDS Prism 80	CALL
IDS Prism 132	CALL
Okidata Microline 80	CALL
Okidata Microline 82A	CALL
Okidata Microline 83A	CALL
Okidata Microline 84	CALL
Centronics 739	\$699
Datasouth 180 cps	CALL

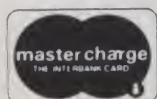
MONITORS

Amdek 12" B&W	\$109
Amdek 13" Color	\$329
Sanyo 9" B&W	\$135
Sanyo 9" Green	\$140
Sanyo 12" B&W	\$179
Sanyo 12" Green	\$189
Sanyo 13" Color	\$359
Zenith 12" Green	\$119
Zenith 13" Color	\$339
ELECTROHOME 13" HI-RES COLOR MONITOR	NEW! \$829
ELECTROHOME 13" COLOR	NEW! \$349
ELECTROHOME 12" B&W	NEW! \$179
ELECTROHOME 12" GREEN	NEW! \$189
ELECTROHOME 9" B&W	NEW! \$149
ELECTROHOME 9" GREEN	NEW! \$159

RAM

16K Ram Kit for Apple II; TRS80	\$19
200 nano seconds, 4116 chips	
Two Kits	\$35
Jumpers	\$2.50

Circle 256 on Reader Service card.



The CPU Shop

TO ORDER CALL TOLL FREE 1-800-343-6522

420-438 Rutherford Ave., Dept. K07M, Charlestown, Massachusetts 02129

Hours: 9 AM - 9 PM (EST) Mon.-Fri. (Sat. till 7)
Technical information call 617/242-3361

TWX- 710-348-1796

Massachusetts Residents call 617/242-3361
Massachusetts Residents add 5% Sales Tax



B. G. MICRO

P. O. Box 280298 Dallas, Texas 75228

(214) 271-5546

Visa • MasterCard • American Express

STATIC RAM

21L02-1KX1 250 n.s.	
Low Power	.95
2114L-3 1KX4 300 n.s.	
Low Power	2.75 8/17.95
HM6116P-4-2KX8 + 5v-200 n.s.	
CMOS Low Power 2716	
Style Pin Out	8/69.95
6501-5 256X4 - CMOS - Data	
Retention 2 Volts - 22 Pin - 200 n.s.	
Typ. - 5V - Very Low Power	1.50
6514-J-5 1KX4-CMOS Super Low	
Power 350 n.s. Similar to 2114	
Same Pin Out	2.95
8108-5 1KX8 NMOS 5V 500 NS	
22 Pin	2.50
TMM2016-2KX8 + 5v-NMOS	
200 n.s. - 2716 Style Pin	
Out	8/69.95

MK4104J-4 250NS	
4K x 1 STATIC 18 PIN CERAMIC	
Computer Mfg. Surplus. PRIME. Fully	
Static. Easy to Use. Has Same Pin Out	
as TMS4044, but slightly different	
timing. With Specs. (Mostek)	
8 for 8.95 32 for 29.95	
VERY LOW POWER!	

DYNAMIC RAM

5280N-5 (2107B-4 • TMS4060)	
4KX1 22 Pin	8/3.95
4027-4KX1-250 n.s.	1.75
4116-16KX1-300 n.s.	8/12.95
4116-16KX1-200 n.s.	8/14.95
4164- +5v 64K	12.95 8/95.00

CRYSTALS

262.144 Khz	1.10	9.90000 Mhz	1.25
300.000 Khz	1.25	10.69425 Mhz	2.49
4444.000 Khz	1.25	10.695000 Mhz	1.59
2.000000 Mhz	2.49	11.088 Mhz	1.59
4.433618 Mhz	1.00	14.31818 Mhz	2.49
5.000000 Mhz	2.49	4.916 Mhz	
5.616 Mhz	1.59	Baud Rate	1.99

8080 SUPPORT

8080A CPU	2.50
8216 Buffer	1.95
8251 USAR	3.95
8253 Baud Rate Gen.	2.95

VOLTAGE REGULATOR

7805	.99	7905	.99
7812	.99	7912	.99
7815	.99	7915	.99
7824	.99	7924	.99
LM317T - To 220	1.60		
LM323K-+5v-3A. To-3	3.95 3/10.00		
LAS 1412-+12v-3A To-3	3.95 3/10.00		

Z80

Z80A-4MHZ CPU	8.95
Z80PIO - Parallel	5.95
Z80SIO/O Chan. Ser.	16.95
Z80A SIO/O	17.95
Z80DMA-DMA Controller	9.95
Z80 2.5 MHZ CPU	4.95

74LS

LS00	.24	LS30	.24	LS125	.95	LS166	.99	LS243	1.49	LS367	.79
LS02	.24	LS32	.36	LS138	.79	LS175	.89	LS244	.99	LS368	.79
LS04	.24	LS42	.49	LS139	.79	LS181	1.99	LS245	1.95	LS373	.99
LS05	.24	LS74	.44	LS151	.79	LS192	.89	LS257	.79	LS374	1.49
LS08	.24	LS85	.95	LS153	.79	LS193	.89	LS266	.59	LS375	1.19
LS10	.24	LS86	.39	LS154	1.75	LS221	1.10	LS283	.99	LS377	1.49
LS14	.89	LS90	.69	LS157	.79	LS240	.99	LS290	.99	LS390	1.19
LS20	.24	LS109	.39	LS161	.99	LS241	.99	LS293	1.75	LS393	1.19
LS27	.24	LS123	.99	LS164	.99	LS242	1.49	LS298	.89	LS399	.99

MISCELLANEOUS

TR1602-UART same as	
AY5-1013	1.99
IM6402-+5v High speed	
UART-AY5-1013 pin out	2.00
AY3-8910-Sound Chip with 60	
page data manual	12.95
82S123-32X8 Tri State Bi polar	
PROM	2.49
MC1408L6 D to A Converter	
8 Bit	1.79
AD561J D to A Converter	
10 Bit	1.79
1771 Single Density FDC	22.50
1791 Double Density FDC	29.95
DM8131 6 Bit Unified Bus	
Comparator	2.99
8 Pin Dip Jumpers	3/1.00
82S129 Tri State Bi Polar Prom	2.59
5027-CRT Controller -	
Programmable - 24 x 80	14.95
68B45 - Motorola (HD46505SP)	
CRT Controller	17.50

CMOS

CD4001	.25	CD4049	.40
CD4011	.25	CD4050	.40
CD4012	.20	CD4066	.65
CD4013	.29	CD4511	.60
CD4017	.85	CD4520	.70
CD4023	.20	74C903	.20
CD4042	.60		

EPROM

1702A 256X8 1 us	2.50
2708 1KX8 450 n.s.	2.95
27A08 1KX8 350 n.s.	3.95
2716 2KX8+5v 450 n.s.	4.00
2716-1 2KX8+5v 350 n.s.	9.95
2732 4KX8 450 n.s. Intel Pin Out	9.95
2532 4KX8 450 n.s. T.I. Pin Out	9.95
2732A-3 4K x 8 350 n.s.	
Intel Pin Out Low Power	12.95

SOCKETS

Low Profile SOLDER TAIL

8 Pin	13/1.00	20 Pin	7/1.00
14 Pin	10/1.00	24 Pin	6/1.00
16 Pin	8/1.00	28 Pin	6/1.00
18 Pin	8/1.00	40 Pin	5/1.00

BUY \$10 GET \$1.00 — FREE CHOICE

CPU

8035	6.95
8039	7.95
8748 Intel	15.95

DIP SWITCHES

5 Position	.65
6 Position	.70
7 Position	.80
8 Position	.90

BIT SLICE

AMD2901-4 Bit Slice	7.95
AMD2903-4 Bit Super	
Slice	12.95
AMD2911 Sequencer	3.95
AMD29705-16 Register	
Files	4.95

TERMS: Add \$1.50 postage, we pay balance. Orders over \$50.00 add 85¢ for insurance. No C.O.D. Texas Res. add 5% Tax. 90 Day Money Back Guarantee on all items. All items subject to prior sale. Prices subject to change without notice. Foreign order - U.S. funds only. We cannot ship to Mexico. Countries other than Canada, add \$3.50 shipping and handling.

CompuPro™



NEW! CPU BOARDS

CO-PROCESSOR 8086/8087 (816)

16 bit 8 or 10 MHz 8086 CPU with sockets

for 8087 and 80130

Part No.	Description	List Price	Our Price
KGGBT106A	A&T 8MHz 8086 only	\$695.00	\$ 625.00
KGGBT106C	CSC 10MHz 8086 only	\$850.00	\$705.00
KGGBT106AB7	A&T with 8087 option	\$1295.00	\$1225.00
KGGBT106C87	CSC with 8087 option*	\$1550.00	\$1450.00

DUAL PROCESSOR 8085-8088

6 or 8 MHz Provides true 16 Bit Power with a standard 8 bit S-100 bus

KGGBT1012A	A&T 6MHz	\$425.00	\$399.00
KGGBT1012C	CSC 6/8 MHz	\$525.00	\$498.00

CPU-Z Z80 CPU

2/4 MHz Z80 CPU 24 Bit Addressing

KGGBT100A	A&T	\$295.00	\$260.00
KGGBT100C	CSC 3-6 MHz	\$395.00	\$375.00



I/O BOARDS

SYSTEM SUPPORT 1 MULTIFUNCTION BOARD

Serial port (software prog. baud), 4K EPROM or RAM provision, 15 levels of interrupt, real time clock, optional math processor

Part No.	Description	List Price	Our Price
KGGBT102A	Assembled & Tested	\$399.00	\$360.00
KGGBT102C	CSC	\$495.00	\$460.00
KGGBT0231	Math Chip		\$195.00
KGGBT0232	Math Chip		\$195.00
KGGBT102AM1	A&T with 8231 Math Chip		\$555.00
KGGBT102CM1	CSC w/8231 Math Chip		\$655.00
KGGBT102AM2	A&T w/8232 Math Chip		\$555.00
KGGBT102CM2	CSC w/8232 Math Chip		\$655.00

MPX CHANNEL BOARD

I/O Multiplexer, using 8085A-2 CPU on board with 4K RAM

KGGBT100A	Assembled & Tested	\$495.00	\$445.00
KGGBT100C	CSC	\$595.00	\$535.00

KGGBT100A16	With 16K RAM		
KGGBT100C16	Assembled & Tested	\$649.00	\$585.00
	CSC	\$749.00	\$675.00

INTERFACER 1

Two Serial I/O

KGGBT133A	Assembled & Tested	\$249.00	\$219.00
KGGBT133C	CSC	\$324.00	\$298.00

INTERFACER 2

Three parallel, one serial I/O board

KGGBT150A	Assembled & Tested	\$249.00	\$219.00
KGGBT150C	CSC	\$324.00	\$298.00

INTERFACER 3

Eight channel multi-use serial I/O board

KGGBT1748A	Assembled & Tested	\$699.00	\$629.00
KGGBT1748C	CSC 200 hr. 8 Port	\$849.00	\$750.00
KGGBT1745A	Assembled & Tested	\$599.00	\$559.00
KGGBT1745C	CSC 200hr. 5 port	\$699.00	\$629.00

NEW!

INTERFACER 4

Three Serial, 1 Parallel, 1 Centronics Parallel

KGGBT107A	Assembled & Tested	\$350.00	\$315.00
KGGBT107C	CSC	\$450.00	\$415.00

SPECTRUM COLOR GRAPHICS

Color Graphics board with Parallel I/O

KGGBT144A	Assembled & Tested	\$349.00	
KGGBT144C	CSC	\$449.00	\$339.00
KGGBT20	Sublogic Universal Graphics Interpreter Software		\$35.00

S-100 MOTHERBOARDS

Active termination, 6-12-20 Slot

KGGBT153A	A&T 6 slot, 2 lbs.	\$140.00	\$126.00
KGGBT153C	CSC 6 slot, 2 lbs.	\$190.00	\$175.00
KGGBT154A	A&T 12 slot, 3 lbs.	\$175.00	\$155.00
KGGBT154C	CSC 12 slot, 3 lbs.	\$240.00	\$220.00
KGGBT155A	A&T 20 slot, 4 lbs.	\$265.00	\$235.00
KGGBT155C	CSC 20 slot, 4 lbs.	\$340.00	\$310.00

ACTIVE TERMINATOR

Allows older S-100 motherboards to run faster and quieter

KGGBT106A	Assembled & Tested		\$59.50
-----------	--------------------	--	---------

CompuPro™



STATIC MEMORY BOARDS

RAM 20 - 32K STATIC RAM

RAM 20 10 MHz, 4K byte block disable, bank select or 24 bit addressing available 8, 16, 24 or 32K

Part No.	Description	List Price	Our Price
KGGBT104AA8	8K A&T	\$210.00	\$190.00
KGGBT104AC8	8K CSC	\$280.00	\$260.00
KGGBT104AA16	16K A&T	\$285.00	\$260.00
KGGBT104AC16	16K CSC	\$355.00	\$325.00
KGGBT104AA24	24K A&T	\$355.00	\$325.00
KGGBT104AC24	24K CSC	\$425.00	\$395.00
KGGBT104AA32	32K A&T	\$425.00	\$395.00
KGGBT104AC32	32K CSC	\$495.00	\$450.00

CMOS STATIC RAM

For a complete analysis of the advantages of CMOS memory, see the "Product Description" on page 416 of the January Issue of BYTE

RAM 17 - 64K CMOS STATIC RAM

RAM 17, 10 MHz, 2 Watt, DMA Compatible 24 Bit Addressing

KGGBT1750A	64K A&T	\$599.00	\$550.00
KGGBT1750C	64K CSC	\$750.00	\$699.00

RAM 16 - 32K x 16 BIT CMOS STATIC RAM

8 and/or 16 Bit

(816) RAM 16 10 MHz, 32K x 16 or 64K x 8

IEEE/696 16 Bit 2 Watt, 24 Bit Addressing

KGGBT100A	64K A&T	\$650.00	\$599.00
KGGBT100C	64K CSC	\$750.00	\$699.00

NEW! RAM 21 - 128K STATIC RAM

(816) RAM 21 12MHz, 128K x 8 or 64K x 16

IEEE/696 8 or 16 Bit 1.2 Amps, 24 Bit Addressing

KGGBT190A	128K A&T	\$1695.00	\$1610.00
KGGBT190C	128K CSC	\$1895.00	\$1795.00

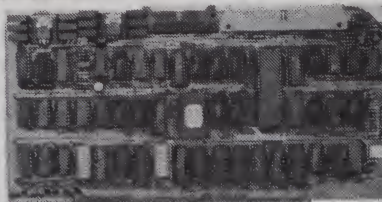
M-DRIVE SOLID STATE DISK DRIVE, (816)

3500% FASTER!

Not Really, But the Next Best Thing for CompuPro 8085/88 Users. Call for Detail on M-Drive.

M-Drive requires a 6MHz CPU 8085/88 dual processor, Disk 1 DMA disk controller and System Support 1 Multifunction Board

KGGBTM0120K	128K of A&T memory & M-Drive Software	\$1196.00
KGGBTM0120KC	128K of CSC memory & M-Drive Software	\$1396.00
KGGBTM0250KA	256K of A&T memory & M-Drive Software	\$2395.00
KGGBTM0250KC	256K of CSC memory & M-Drive Software	\$2795.00



DISK CONTROLLERS

DISK 1 FLOPPY CONTROLLER

Fast DMA, Soft Sector, Controls 8" or 5 1/4" Single or

Double Density. OUR BEST!

KGGBT171A	A&T	\$495.00	\$450.00
KGGBT171C	CSC	\$595.00	\$555.00
KGGBTCPM80*	CP/M 2.2 for Z80/8085 with manuals & BIOS 8" S/D disk		\$175.00

KGGBTCPM86	CP/M for 8086 with manuals & BIOS 8" S/D disk		\$300.00
KGGBT0A8S	Oasis 8 bit single user 8" S/D disk	\$500.00	
KGGBT0A8MS	Oasis 8 bit multiuser, 8" S/D disk	\$850.00	

NEW! DISK 2/SELECTOR CHANNEL HARD DISK CONTROLLER

Fast DMA 2 board set. Controls 4 Shugart 4000 series or Fujitsu 2300 type drives

KGGBT177A	Assembled & Tested	\$795.00	\$750.00
KGGBT177C	CSC	\$895.00	\$850.00



S-100 MAINFRAME

110V 60Hz CVT Mainframe uses famous 20 slot

COMPUPRO Motherboard. 55 lbs.

KGGBTENC200M	20 Slot Rack Mount	\$895.00	\$825.00
KGGBTENC200K	20 Slot Desk Top	\$825.00	\$760.00

MORROW DESIGNS



FLOPPY DISK CONTROLLERS & SUBSYSTEMS

DISK JOCKEY 2D FLOPPY CONTROLLER

Memory mapped controller handles 4 8" drives, single or double density

Part No.	Description	List Price	Our Price
KGMOSQJ2206	A&T w/CP/M™ 2.2	\$399.00	\$375.00

DISCUS 2D & DISCUS 2+2 SUBSYSTEMS

Each subsystem includes DJ/2B controller 8" double density drives with cabinet, power supply, CP/M™ 2.2 and Microsoft Basic

KGMOSF1216	1 Drive 30 lbs.	\$1095.00	\$ 950.00
KGMOSF1220	2 Drive 48 lbs.	\$1875.00	\$1675.00

DOUBLE SIDED - DISCUS 2+2

KGMOSDF812	1 Drive 30 lbs.	\$1395.00	\$1250.00
KGMOSDF822	2 Drive 48 lbs.	\$2495.00	\$2200.00

DISK JOCKEY/DMA FLOPPY CONTROLLER

DMA Controller supports 4 soft-sectored 8" drives and 4 10 sector 5 1/4" drives simultaneously. On board Z80A

KGMOSDJ0MA	A&T w/CP/M™ 2.2	\$495.00	\$450.00
------------	-----------------	----------	----------

DISK JOCKEY DMA SUBSYSTEMS

Each subsystem includes DJ/DMA controller, 8" double-density drives or 5 1/4" 48 TPI drives, cabinet, power supply, CP/M™ 2.2 and Microsoft BASIC

KGMOSDF11	1 Drive 30 lbs.	\$1195.00	\$1050.00
KGMOSDF821	2 Drive 48 lbs.	\$1975.00	\$1775.00

DOUBLE SIDED DISCUS 2+2/DMA

KGMOSDF812	1 Drive 30 lbs.	\$1495.00	\$1325.00
KGMOSDF822	2 Drive 48 lbs.	\$2575.00	\$2295.00

DOUBLE SIDED - DISCUS MINI-FLOPPY/DMA

KGMOSDF512A	1 Drive 17 lbs.	\$ 995.00	\$895.00
KGMOSDF522A	2 Drive 32 lbs.	\$1695.00	\$1525.00



NEW!

S-100 5-26 MB HARD DISK SUBSYSTEMS

5 - 10 Mb DMA SUBSYSTEMS

Each subsystem includes DMA Hard Disk Controller, Seagate ST506 5 Mb or ST412 10 Mb 5 1/4" Hard Disk, Cabinet, power supply, CP/M™ 2.2 and Microsoft BASIC.

KGMOSMAM*	Software supplied on 8" IBM 3740 disk with blank I/O and INSTALL program		
KGMOSMAM*2B	Software configured for Morrow DJ/2B controller and Multi I/O as console		
KGMOSMAM*DMA	Software configured for Morrow DJ/DMA controller and Multi I/O as console		
KGMOSMAM*NS	Software supplied on 5 1/4" 10 sector North Star disk with blank I/O and INSTALL Program		

Replace * in above part numbers with 5 for 5Mb Subsystems or 10 for 10Mb Subsystems.

DISCUSM5	5Mb Subsystems	\$2195.00	\$1975.00
DISCUSM10	10Mb Subsystems	\$3195.00	\$2875.00

(order by part numbers listed above)

DISCUS HDC 20-26 Mb SUBSYSTEMS

Each subsystem includes HDCA3 I/O mapped controller, Shugart SA4008 14" 26Mb or Fujitsu 2308 8" 20Mb Hard Disk, cabinet, power supply, CP/M™ 2.2 & Microsoft BASIC.

KGMOSHOC20	Discus M20 A&T	\$4795.00	\$3995.00
KGMOSHOC26	Discus M26 A&T	\$4495.00	\$3895.00

I/O BOARDS

MULTI I/O

KGMOSMB3200	Three Serial, Two Parallel Assembled & Tested	\$359.00	\$329.00
-------------	---	----------	----------

SWITCHBOARD

Two serial I/O, four parallel I/O, one status port, one strobe port

KGMOSB2411		\$299.00	\$269.00
------------	--	----------	----------

**ADVANCED
MICRO DIGITAL
CORPORATION**

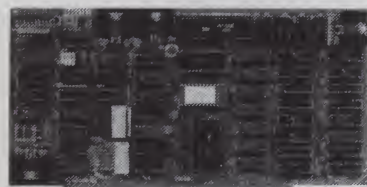


SUPERQUAD - ADVANCED MICRO DIGITAL AT LAST, A FULL S-100 SYSTEM ON A SINGLE BOARD!

- IEEE S-100 Bus Compatible • Z80A CPU @ 4MHz • Floppy Disk Controller, Single & Double Density (Supports up to 4 disk drives 5 1/4" or 8") • 64Kb Memory, 16K Bank Selectable • S-100 Extended Address A16-23 • 2 Serial and 2 Parallel I/O Ports • 2K or 4K of Shadow EPROM • Real Time Interrupt Clock • One Year Warranty • Runs with CP/M, MP/M, CP/NET • All of These Features on a Single Standard Size S-100 Board.

Part No.	Description	List Price	Our Price
KGMA0SDC1	A&T w/Asynch RS232 ports	\$875.00	\$795.00
KGMA0PS1	1 Asynch adapter board required for each serial port used	\$ 30.00	

SSM



VIDEO AND I/O

VB 3 - HIGH RESOLUTION VIDEO

80 x 25 or 50 character video display Memory Mapped, Parallel Keyboard port

KGSSMVB3A24	80 x 24 A&T	\$499.00	\$440.00
KGSSMVB3UP	80 x 50 Line Upgrade		\$ 30.00

VB 2 - I/O MAPPED 64 x 16 DISPLAY

I/O Mapped Video Board, with Parallel Keyboard port 64 x 16

KGSSMVB2A	Assembled & Tested	\$269.00	\$229.00
-----------	--------------------	----------	----------

VB1B MEMORY MAPPED 64 x 16 DISPLAY

Memory Mapped Video Board 64 x 16 character display or 64 x 16 graphics display

KGSSMVB1A	Assembled & Tested	\$242.00	\$220.00
-----------	--------------------	----------	----------

I/O 4

Two serial I/O, two parallel I/O

KGSSMI04A	Assembled & Tested	\$290.00	\$260.00
-----------	--------------------	----------	----------

NEW! I/O 5

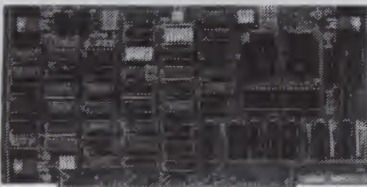
2 Serial, 3 parallel Including 1 Centronics

KGSSMI051	Assembled & Tested	\$329.00	\$309.00
-----------	--------------------	----------	----------

NEW! I/O 8

8 Port Serial I/O with Timer

KGSSMI08A	Assembled & Tested	\$550.00	\$495.00
-----------	--------------------	----------	----------



CPU, RAM & PROM

CB2 Z80 CPU

KGSSMCB2A	2/4 MHz will accept 2716, or 2732, or RAM Assembled & Tested	\$299.00	\$275.00
KGSSMZ80M	SSM Z80 Monitor		\$ 80.00

MB10A 16/8K 8/16 BIT STATIC RAM

16K byte /8K word, 24 bit extended, addressing, "M write," Phantom disable, addressable in 4K blocks

KGSSMB10A	Assembled & Tested	\$299.00	\$275.00
-----------	--------------------	----------	----------

MB8A 1K/16K EPROM BOARD

1K/16K 2708 EPROM board, disable in 1K increments

KGSSMB8AA	Assembled & Tested	\$179.00	\$159.00
-----------	--------------------	----------	----------

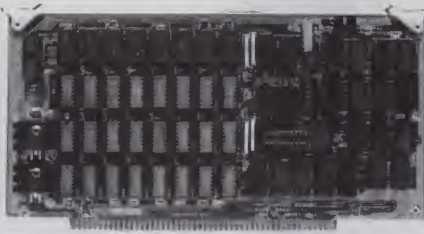
PBI PROM PROGRAMMER

Programs 2708 or 2716's, operates as a

4K/8K EPROM BOARD AS WELL

KGSSMPB1A	Assembled & Tested	\$265.00	\$220.00
-----------	--------------------	----------	----------

**California
Computer
Systems**



CPU BOARDS

2810 Z80 SBC CPU

2/4 MHz Z80A CPU with RS232C Serial I/O Port complete with Monitor PROM for 2422 Disk Controller

Part No.	Description	List Price	Our Price
KGCCS2810A	Assembled & Tested		\$309.00

2820 Z80 DMA CPU

4MHz Z80 with 2 RS232C Serial Ports, Centronics Parallel Port, separate data and status ports and DMA Daisy Chain Capability

KGCCS2820	Assembled & Tested		\$595.00
-----------	--------------------	--	----------

I/O BOARDS

2830 - 6 PORT SERIAL

Six Asynchronous RS232C Ports using three Z-80 DARTS. Programmable baud rates.

KGCCS2830	Assembled & Tested		\$550.00
-----------	--------------------	--	----------

2710 4 PORT SERIAL

4 Full handshaking RS232 ports and optional 2K ROM

KGCCS271001	Assembled & Tested		\$325.00
-------------	--------------------	--	----------

2719 2 SERIAL & 2 PARALLEL

2 RS232C ports, 2 8 bit parallel ports & optional 2K ROM

KGCCS271901	Assembled & Tested		\$360.00
-------------	--------------------	--	----------

2720 4 PORT PARALLEL

4 8 bit parallel ports and optional 2K ROM

KGCCS272001	Assembled & Tested		\$275.00
-------------	--------------------	--	----------

2422 FLOPPY DISK CONTROLLER

I/O Mapped, controls 8", single or 5 1/4" double density A&T with CPM "2.2 8" S.D.

KGCCS2422A	Assembled & Tested		\$425.00
------------	--------------------	--	----------



MEMORY BOARDS

2065 64K DYNAMIC MEMORY BOARD

64K 4MHz, Z80 or 8080 compatible, bank select for memory expansion to 512K, DMA compatible.

KGCCS2065	Assembled & Tested	\$375.00	\$350.00
-----------	--------------------	----------	----------

2066 BANK SWITCH DYNAMIC MEMORY

64K Memory with bank and block select switching functions for Cromemco Cromix™ & Alpha Microsystems

KGCCS2066	Assembled & Tested	\$450.00	\$425.00
-----------	--------------------	----------	----------

2116 16K STATIC RAM

16K 4MHz using 2114 RAMs. Maybe divided into 4K blocks Cromemco & Alpha Microsystems compatible

KGCCS21163	Assembled & Tested		\$295.00
------------	--------------------	--	----------

2032 32K STATIC RAM

32K 4MHz using 2114s. Divided into 4 8K blocks. Bank-port/bank-byte scheme compatible with Cromemco and Alpha Microsystems.

KGCCS2032	Assembled & Tested		\$500.00
-----------	--------------------	--	----------

S-100 MAINFRAME

12-slot motherboard with removable termination card

KGCCS220001	Office Cream	35 lbs.	\$575.00
KGCCS220002	Blue	35 lbs.	\$575.00

**SEND \$1.00 TODAY
FOR THE NEW, FULL COLOR
SPRING 1982 ENGINEERING
SELECTION GUIDE!**

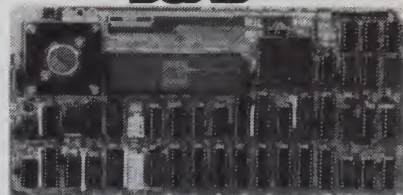


PRIORITY ONE ELECTRONICS

9161 DEERING AVE • CHATSWORTH, CA 91311

Terms: U.S. VISA, MC, BAC, Check, Money Order, U.S. Funds Only. CA residents add 6% Sales Tax. MINIMUM PREPAID ORDER \$15.00. Include MINIMUM SHIPPING & HANDLING of \$3.00 for the first 3 lbs. plus 25¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, please include your phone number. Prices subject to change without notice. We will do our best to maintain prices through June, 1982. Credit Card orders will be charged appropriate freight. If you haven't received your Spring '82 Engineering Selection Guide by May 10th, send \$1.00 for your copy. Sale prices are for prepaid orders only.

DUAL



**1
ONE**

CPU BOARDS

CPU/68000 - 8MHz 68000 CPU

16 bit 68000 CPU with on board ROM containing MACSBUS Monitor or Motorola 68541 Memory Management Unit (MMU).

Part No.	Description	List Price	Our Price
KGOLCPUS6000	A&T with Monitor	\$1195.00	\$1075.00
KGOLCPUS6000M	A&T with MMU	\$1495.00	\$1395.00

MEMORY BOARDS

DMEM256KP-256K DYNAMIC MEMORY MODULE

256Kb with byte parity error detection for 8 or 16 bit computers

KGOLMEM256	256K A&T	\$1495.00	\$1395.00
------------	----------	-----------	-----------

CMEM NONVOLATILE CMOS MEMORY

Nonvolatile CMOS memory with 3-10 year battery backup on board.

KGOLCMEM8	8K A&T	\$695.00	\$629.00
KGOLCMEM16	16K A&T	\$795.00	\$725.00
KGOLCMEM32	32K A&T	\$995.00	\$840.00

2716/2732 EPROM BOARD

WITH 16 BIT DATA PATHS

Designed to hold 32Kb of 2716 type or 64Kb of 2732 type EPROMs, or ROMs for read only use with 16 bit CPU systems.

KGOLEPROM32	2716 EPROM Board A&T	\$295.00	\$280.00
KGOLEPROM64	2732 EPROM Board A&T	\$295.00	\$280.00

REAL TIME & DATA ACQUISITION

AIM 12-12 BIT A/D CONVERTER

A/D input module with 12 bit accuracy, 32 input channels and optional instrumentation amplifier

KGOLAIM12	A&T with Instrumentation Amp.		\$745.00
KGOLAIM12B	A&T without Instrumentation Amp.		\$660.00

AOM 12-12 BIT D/A CONVERTER

D/A output module, 4 channels, 12 bit accuracy. Optional VIC420 industrial output module (4-20Ma), 4 channels, used in conjunction with AOM12.

KGOLAOM12	Assembled & Tested	\$675.00	\$640.00
KGOLVIC420	Assembled & Tested	\$675.00	\$640.00

CLK24-NONVOLATILE CLOCK/CALENDAR

Day, date, hours, minutes, seconds, and 3-5 year battery backup on board. Read or write directly from I/O port. Jumperable for 64Hz UNIX® or real time applications.

KGOLCLK24C	A&T w/64Hz Interrupt	\$300.00	\$265.00
------------	----------------------	----------	----------

SOFTWARE

DIGITAL RESEARCH

KGDIRCPM	CP/M 2.2 Control Program/ Microcomputers	\$150.00
KGDIRMAC	MAC Macro Assembler	\$ 90.00
KGDIRRMAC	RMAC Relocating MAC	\$200.00
KGDIRSID	SID Symbolic Instruction Debugger	\$100.00
KGDIRTEX	TEX Text Formatter	\$100.00
KGDIRDES	DESPOOL Background Print Utility	\$ 50.00
KGDIRCB00	CBASIC Programming Language	\$150.00
KGDIRCB86	CBASIC-86 Programming Language	\$325.00

MICROPRO INTERNATIONAL

KGMSWOSTR	Wordstar Version 3.0	\$300.00
KGMSMLMRG	Mail Merge	\$100.00
KGMOSSPSTR	Spell Star	\$150.00
KGMOSSCALSTR	Calc Star	\$200.00
KGMOSSATSTR	Data Star	\$200.00
KGMOSSUPSET	Supersort	\$150.00

SORCIM

KGSORSCAL	SUPERCALC a Superior Electronic Worksheet	\$295.00
KGSORACTI	ACT I 8080/Z80 Assembler	\$175.00
KGSORACTII	ACT II 8086/8088 Assembler	\$175.00
KGSORTRNS	TRANS 8086/8088 Translator	\$125.00
KGSORPM80	PASCAL/M REL4 8080/8085/Z-80	\$395.00
KGSORPM88	PASCAL/M 8086	\$495.00

MICROSOFT

KGMSBAS80	BASIC-80 Version 5.X Extended Disk Basic	\$300.00
KGMCBPASC	BASIC Compiler Version 5.X	\$395.00
KGMSMFT	FORTRAN-80	\$500.00



1 FUJITSU & NEC LETTER QUALITY PRINTERS FROM SELLUM



Interfaces: • RS232C and Current Loop • Centronics type parallel interface • IEEE488 All are DIP switch selectable.
Personality Protocols: • NEC5510 • DIABLO 630 • QUME Sprint 9 • IBM Personal Computer • ATARI (Centronics 737).
Special Features: • Z80 CPU • 12K ROM • Standard 16K Buffer • Optional 48K Buffer • 50 - 192K baud • Micro-coded alarm differentiates error conditions with pulse combinations • Intelligent bi-directional printing with logic seeking • Complete word processing features • Self test • Auto reprint • Auto clear error • Proportional spacing • Supports Automatic justification • Complete Vector plotting routines • Sheet feeder mode allows easy interface to most mechanical sheet feeders • 6 month warranty • Quiet - 60db • Front panel forms control • Universal power supply 115/220V 50/60 Hz.

80 CPS USING THE FUJITSU SP830

Part No.	Description	List Price	Our Price
KGSLMF08	Intelligent Printer	\$3495.00	\$2995.00

OPTIONS

KGSLMF06VFT	Vertical forms tractor	\$200.00
KGSLMF0648K	48K RAM buffer	\$400.00

Call for pricing on sheet feed options

55 CPS USING THE NEC 7700

KGSLMN77	Intelligent Printer	\$3295.00	\$2895.00
----------	---------------------	-----------	-----------

OPTIONS

KGSLMN77VFT	Vertical Forms Tractor	\$ 230.00
KGSLMN77BOFT	Bidirectional Forms Tractor	\$ 400.00
KGSLMN77CSF	NEC Cut Sheet Feeder	\$1595.00
KGSLMN77CSF2	Twin Cut Sheet Feeder	\$2150.00
KGSLMN7748K	48K RAM Buffer	\$ 400.00

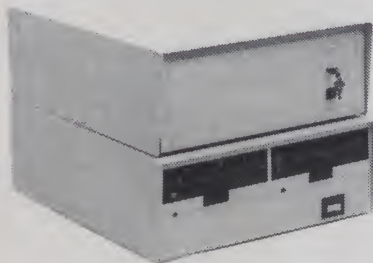
*Must be ordered with the printer

INTERFACE CABLES

KGCPAM572	Centronics IBM/NEC Cable	\$80.00
KGSC0251	RS232C Serial Cable	\$60.00

Call for other cables not listed

Para Dynamics



18 SLOT S-100 MAINFRAME

CVT Power Supply, forced air cooling; security lock 120 or 220V AC at 50 or 60Hz+8V@20A, ±16@3.5
 KGPN20100 Desk Top \$799.00 \$699.00
 KGPN2010R Rack Mount \$849.00 \$749.00

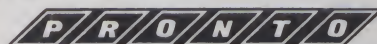
8 SLOT S-100 MAINFRAME WITH CUTOFFS FOR 2 5 1/4" DISK DRIVES

+5@5A, -5@500MA, +8@15A, +12@6A, +16@2,	
KGPN25080 Desk Top	\$899.00 \$789.00
KGPN2508R Rack Mount	\$949.00 \$839.00

DISK DRIVE FACILITY

Accommodates two 8" floppy drives, of Shugart, Qume, or similar design and dimensions. 110 or 220V AC at 50 or 60Hz CVT power.

KGPN22000 Desk Top	\$659.00 \$579.00
KGPN2200R Rack Mount	\$679.00 \$595.00



Free standing cabinet. Will accept 2, 8" Floppy disks and 1, 8" Rigid disk. 18 slot card cage will accept the double height 10" x 10" S-100 cards (Alpha Micro and others) CVT Power Supply.

+24@7A, +16@2.2A, -16@3.5A, +8@20A, +5@5A	
KGPN2018 PRONTO	\$1295.00 \$1129.00
PRONTO COMPLETE WITH POWER SUPPLY POWER-UP SEQUENCER with sequencer	\$1395.00 \$1240.00

Shipped motor freight collect

OKIDATA



- BI-DIRECTIONAL-120 CPS • Parallel and Serial I/O
- 9x9 Matrix (Alphanumeric) • 100 Thru 1200 Baud
- 6x9 or 12 matrix for graphics • Self Test
- 5,8,3,10,16 Characters p/inch • Out of paper switch
- 6 or 8 Lines per Inch • Friction or Tractor Feed
- 80 CPL @ 10 CPI for 82A • 3" to 14" Top of form
- 132 CPL @ 10 CPI for 83A & 10 Different Character Sets

The above printers come complete with friction and tractor feed. Front panel selection of 10 different form lengths. Front or bottom paper loading for up to 4 part forms and tear bar. All three printers have a parallel interface as standard. The 82A and 83A also include a 1200 baud serial interface as standard.

Part No.	Description	List Price	SALE
KGOKIOAT82AT	80 column printer w/tractor (25 lbs.)	\$539.00	
KGOKBFRAPH82	High resolution graphics ROM 60x66	\$ 75.00	
KGOKIOAT83AT	132 column printer w/tractor (35 lbs.)	\$750.00	
KGOKIGRAPH83	High resolution graphics ROM 60x66	\$ 75.00	
KGOKISER2KBF	9600 Baud 2K serial buffer interface	\$140.00	
KGOKIOAT84AP	132 col. printer parallel interface with graphics (35 lbs.)	\$ 1095.00	
KGOKIOAT84AS	132 Col. printer 9600 baud serial 2K interface with graphics (35 lbs.)	\$ 1250.00	
KGMB5APLINTWC*	Apple Parallel Interface w/cable (1 lb.)	\$ 75.00	

*Sold only with printers

EPSON

KGEPNMX00	80 col/CPS tractor feed (17 lbs.)	\$450.00
KGEPNMX00FT	with Tractor/Friction feed (20 lbs.)	\$550.00
KGEPNMX100	132 col./80CPS (30 lbs.)	\$725.00
	Tractor/Friction Feed	
KGMB5APLINTWC*	Apple parallel interface with cable	\$ 75.00
KGMB5E11*	Serial interface for EPSON Printers	\$ 50.00

*Sold only with printers

ADDS Applied Digital Data Systems Inc.



SALE!
\$525.00

VIEWPOINT - ADDS

Detachable keyboard, RS232 interface and auxiliary port, 80 x 24 display, tiltable screen.
 KGAD00VWPR Sh. weight: 30 lbs. \$699.00 \$525.00

DISK CABINETS

V-100 - VISTA

- Desk or rack mountable • Internal power and data cables
- Drives pull out for easy service and maintenance

KGVIS100	Disk Drive Cabinet (43 lbs)	\$495.00	\$449.00
----------	-----------------------------	----------	----------

SINGLE 8" - Q.T.

KGQTC00C8	Single 8" cabinet with power supply (22 lbs.)	\$249.00	\$225.00
-----------	---	----------	----------

DUAL 8" - Q.T.

KGQTC00C88	Dual 8" cabinet with power supply (24 lbs.)	\$395.00	\$349.00
------------	---	----------	----------

5" CABINETS - VISTA

KGVIS0001	Single 5" with P.S.	\$ 85.00
KGVIS0002	Dual 5" with P.S.	\$110.00

Overseas Customers Send \$4.00 U.S. Currency or 22 International Reply Coupons to Receive Our New Catalog by Airmail



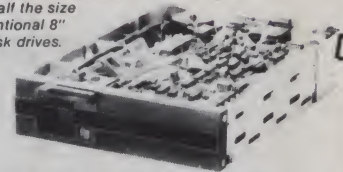
PRIORITY ONE ELECTRONICS

9161 DEERING AVE • CHATSWORTH, CA 91311
 ORDER TOLL FREE (800) 423-5922 - CA, AK, HI CALL (213) 709-5464

Terms: U.S. VISA, MC, BAC, Check, Money Order, U.S. Funds Only. CA residents add 6% Sales Tax. MINIMUM PREPAID ORDER \$15.00. Include MINIMUM SHIPPING & HANDLING of \$3.00 for the first 3 lbs., plus 25¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, please include your phone number. Prices subject to change without notice. We will do our best to maintain prices through July, 1982. Credit Card orders will be charged appropriate freight. If you haven't received your Spring '82 Engineering Selection Guide, send \$1.00 for your copy today! Sale prices are for prepaid orders only.

Tandon

Tandon TM-800 Thinline is exactly half the size of conventional 8" floppy disk drives.



Exactly one-half the height of any other model. Proprietary, high-resolution, read-write heads patented by Tandon

D.C. only operation - no A.C. required

Industry standard interface.
 Three millisecond track-to-track access time (9 lbs.)
 KGTHMTM8481 Single Sided \$425.00 2 or more \$395.00
 KGTHMTM8482 Double Sided \$575.00 2 or more \$550.00
 KGTHMTM8M Manual - not included with drive \$ 10.00

TANDON 5 1/4" DRIVES

KGTHMTM1001	Single Sided, 250KB (5 lbs.)	\$249.00 ea
	2 or More \$220.00	
KGTHMTM1002	Double Sided, 500KB	\$325.00 ea.
	2 or More \$299.00	
KGTHMTM1003	Single Sided, 500KB	\$325.00 ea.
	2 or More \$299.00	
KGTHMTM1004	Double Sided, 1000KB	\$449.00 ea.
	2 or More \$420.00	
KGTHMTM5M	manual, not included with drive	\$ 10.00

*As used in the IBM P.C.

MITSUBISHI ELECTRIC



Better Than QUME!
Better Than SHUGART!

8", Double-sided, double-density, interchangeable with QUME & Shugart
 KGMITM280463 Sh. Weight 16 lbs. \$550.00
 KGMITM280463M Manual \$ 10.00
 2 or More \$525.00 each

Shugart 801R

Single sided, double density - most popular 8" drive
 KGSNU001R \$425.00 ea. or 2 or more (16 lbs) for \$395.00 ea.
 KGSNU001RM Manual for 801R drives \$ 10.00



INTERNATIONAL INSTRUMENTATION, INC.



UNIVERSAL DISK ENCLOSURES

- Accepts any combination of 8" drives (QUME/Shugart 801R type or 1/2 size Tandon type) • Also accepts hard disks • Positive pressure • Optional Disk environment monitor shows supply voltage and internal cabinet temperature • Internal power and data cables provided.

UNIVERSAL DRIVE CABINET complete with power supply, fan and filter, and all internal cables for attachment of two 8" floppy drives.

KGIIU0E004	Dual Drive Cabinet (Sh. Wt. 40 lbs)	\$495.00	\$450.00
KGIIU0E004EM	w/Environmental Monitor installed	\$584.95	\$535.00
KGIIU0E004AUG	Dual Drive cabinet with Augmentation power supply module to increase 5V supply from 6 amps to 12 amps for use with two hard disks or 4 Tandon drives. Also includes Disk Environment Monitor (45 lbs.)	\$733.00	\$650.00

KGIIU0ERCK 19" Rack Mount kit UDE004 \$ 89.95

THIN THREE DRIVE CABINET complete with power supply, and all internal cables for attachment of three thin 8" floppy drives (Tandon type). One AC power connector is also provided for use with full size drive.

KGIIU0ETT	Three Drive Cabinet (Sh. Wt. 35 lbs)	\$495.00	\$450.00
KGIIU0ETTMM	with Environmental Monitor installed	\$584.95	\$535.00

READER SERVICE

A. From which of the following companies have you purchased software?

- ☐ 1. Advanced Operating Systems
- ☐ 2. Adventure International
- ☐ 3. Automated Simulations
- ☐ 4. Big Five
- ☐ 5. Broderbund
- ☐ 6. Med Systems
- ☐ 7. Meta Technologies
- ☐ 8. Radio Shack
- ☐ 9. Sirius Software
- ☐ 10. Snappware
- ☐ 11. Soft Sector Marketing
- ☐ 12. The Cornsoft Group

B. On the average, how many of each issue's program listings do you actually type in?

- ☐ 1. 0
- ☐ 2. 1
- ☐ 3. 2
- ☐ 4. 3 or more

C. If you don't enter programs, why not?

- ☐ 1. Don't apply to my system
- ☐ 2. Listing too long
- ☐ 3. Not useful
- ☐ 4. Not interesting

D. I need the information requested on this card for:

- ☐ 1. Immediate purchase
- ☐ 2. Purchase in 1-2 months
- ☐ 3. Brand comparisons
- ☐ 4. Reference collection

E. What types of advertising (besides microcomputing equipment) would you like to see in *Microcomputing*?

- ☐ 1. Business products
- ☐ 2. Consumer products
- ☐ 3. Travel
- ☐ 4. Hobby equipment
- ☐ 5. Other _____

F. What will be your next major hardware purchase? Check one only.

- ☐ 1. Printer
- ☐ 2. Modem
- ☐ 3. Disk system

G. What peripherals do you own?

- ☐ 1. Disk drives
- ☐ 2. Expansion interface
- ☐ 3. Fixed disk
- ☐ 4. Joy stick
- ☐ 5. Modem
- ☐ 6. Printer
- ☐ 7. Sound mod

H. What types of computer equipment, besides your micro, do you use?

- ☐ 1. Mainframe
- ☐ 2. Mini
- ☐ 3. Calculator

I. Do you feel that your financial investment in computer equipment has been worthwhile?

- ☐ 1. Yes
- ☐ 2. No

J. How much time per month do you spend on hobby activities other than microcomputing?

- ☐ 1. None
- ☐ 2. Less than 10 hours
- ☐ 3. 10-20 hours
- ☐ 4. More than 20 hours

K. Are you currently a member of a network?

- ☐ 1. Yes
- ☐ 2. No

L. On a scale of 0 (no interest) to 5 (most interest) rate your interest in using or learning each of the following languages:

- ☐ 1. Assembler
- ☐ 2. BASIC
- ☐ 3. COBOL
- ☐ 4. FORTRAN
- ☐ 5. PASCAL
- ☐ 6. PILOT

M. Approximately how much per year do you spend on purchase from the mail order ads in *Microcomputing*?

- ☐ 1. Nothing
- ☐ 2. Less than \$100
- ☐ 3. \$100-\$500
- ☐ 4. \$501-\$1,000
- ☐ 5. Over \$1,000

N. If you are not a subscriber, circle 500.

advertised in this issue. Refer to the ad. You will find numbers near the logo of each advertiser. Each represents the advertiser's individual Reader Service number. Circle the corresponding numbers on one of the cards on this page, include your name, address & zip, and drop in a mailbox. In 4-6 weeks you'll hear from the advertiser directly.

This card is valid until August 31, 1982

1	6	11	16	21	126	131	136	141	146	251	256	261	266	271	376	381	386	391	396
2	7	12	17	22	127	132	137	142	147	252	257	262	267	272	377	382	387	392	397
3	8	13	18	23	128	133	138	143	148	253	258	263	268	273	378	383	388	393	398
4	9	14	19	24	129	134	139	144	149	254	259	264	269	274	379	384	389	394	399
5	10	15	20	25	130	135	140	145	150	255	260	265	270	275	380	385	390	395	400
26	31	36	41	46	151	156	161	166	171	276	281	286	291	296	401	406	411	416	421
27	32	37	42	47	152	157	162	167	172	277	282	287	292	297	402	407	412	417	422
28	33	38	43	48	153	158	163	168	173	278	283	288	293	298	403	408	413	418	423
29	34	39	44	49	154	159	164	169	174	279	284	289	294	299	404	409	414	419	424
30	35	40	45	50	155	160	165	170	175	280	285	290	295	300	405	410	415	420	425
51	56	61	66	71	176	181	186	191	196	301	306	311	316	321	426	431	436	441	446
52	57	62	67	72	177	182	187	192	197	302	307	312	317	322	427	432	437	442	447
53	58	63	68	73	178	183	188	193	198	303	308	313	318	323	428	433	438	443	448
54	59	64	69	74	179	184	189	194	199	304	309	314	319	324	429	434	439	444	449
55	60	65	70	75	180	185	190	195	200	305	310	315	320	325	430	435	440	445	450
76	81	86	91	96	201	206	211	216	221	326	331	336	341	346	451	456	461	466	471
77	82	87	92	97	202	207	212	217	222	327	332	337	342	347	452	457	462	467	472
78	83	88	93	98	203	208	213	218	223	328	333	338	343	348	453	458	463	468	473
79	84	89	94	99	204	209	214	219	224	329	334	339	344	349	454	459	464	469	474
80	85	90	95	100	205	210	215	220	225	330	335	340	345	350	455	460	465	470	475
101	106	111	116	121	226	231	236	241	246	351	356	361	366	371	476	481	486	491	496
102	107	112	117	122	227	232	237	242	247	352	357	362	367	372	477	482	487	492	497
103	108	113	118	123	228	233	238	243	248	353	358	363	368	373	478	483	488	493	498
104	109	114	119	124	229	234	239	244	249	354	359	364	369	374	479	484	489	494	499
105	110	115	120	125	230	235	240	245	250	355	360	365	370	375	480	485	490	495	500

Name _____

Address _____

City _____

State _____

Zip _____

Microcomputing • July 1982

MICROCOMPUTING

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 306 DALTON MA 01226

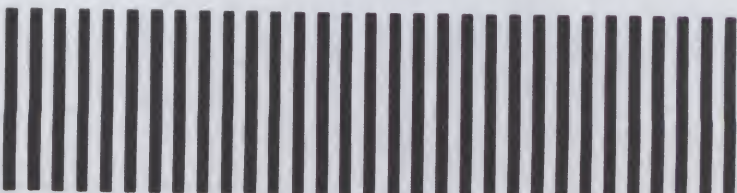
POSTAGE WILL BE PAID BY ADDRESSEE.

MICROCOMPUTING®

P.O. Box 316

Dalton, MA 01226-0316

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



Microcomputing® • List of Advertisers

Reader Service Number	Page	Reader Service Number	Page	Reader Service Number	Page
314 A Bargain Distributors.....	160	78 Expotek.....	26	130 Optronics Technology.....	101
273 A B M Products.....	51	191 Floppy Disk Services.....	63	204 PDS Inc.....	107
469 ABCOM Corp.....	142	22 Gimix, Inc.....	143	454 PBL Corp.....	140
91 Aardvark-80.....	57	392 Golden West Computers, Inc.....	59	172 Pacific Exchanges.....	83, 89, 97, 103
51 Abex.....	75	104 Gosub International.....	29	* Percom Data Company, Inc.....	CII
249 Alien Group, The.....	44	6 H&E Computronics.....	109	19 Peripherals Unlimited.....	55
56 American Square Computers.....	154, 155	472 HF Signalling Inc.....	149	266 Perry Oil & Gas.....	152
187 Ancie Labs.....	8	243 Happy Hands.....	156	370 Personal Computer Age.....	161
495 Anthro-Digital Inc.....	152	480 Holmes Engineering.....	146	146 Pocket Computer Newsletter.....	33
488 Applied Micro Sciences.....	151	235 I.B. Computers.....	97	277 Priority One.....	128-130
496 Avon Hill Game Company.....	151	279 IDPC.....	89	446 Professional Micro Systems Inc.....	140
* B.G. Micro.....	127	486 Information Intelligence Inc.....	150	493 Professional Software Inc.....	152
124 B.T. Enterprises.....	145	138 Inmac.....	30	490 Professional Software Technology Inc.....	151
* Back Issues.....	89	128 Innovative Technology.....	103	202 Progressive Computing.....	151
211 Bartleby's Software Service.....	25	479 Instrutek.....	149	233 Protecto Enterprises.....	96
131 Bay Technical Associates.....	30	77 Integrand Research Corp.....	83	98 The Purchasing Agent.....	79
452 Basic Business Software Inc.....	140	485 Integron Systems.....	150	44 Quest Electronics.....	120
449 Beaman Porter Inc.....	140	461 Interface Inc.....	140	491 RAK Electronics.....	151
470 Binary Corporation.....	150	476 Interplanetary Computer Systems.....	147	390 R.W. Electronics.....	110
487 Binary Corporation.....	150	84 J.D.R. Microdevices.....	132-135	101 Racet Computes Ltd.....	56
326 Bourbon Street Press.....	82	180 J.E.S. Graphics.....	92	61 Radix Technologies.....	146
481 Business & Professional Software Inc.....	150	92 J.P.C. Products.....	152	489 Rainbow Computing Inc.....	151
344 Bytewriter.....	99	48 Jade Computer Products.....	121-123	188 Rainbow P & P Corp.....	22
468 Bytewriter.....	142	41 Jameco Electronics.....	124, 125	102 Rand's, Inc.....	34
79 C & S Electronics Mart Ltd.....	75	164 Jimscot, Inc.....	70	71 Realty Software Company.....	83
148 CDR Systems, Inc.....	75	* John Bell Engineering, Inc.....	69	142 Riverbank Software.....	80
110 CFR Associates.....	92	222 Kalglo Electronics.....	34	132 68 Micro Journal.....	103
256 CPU Shop, The.....	126	198 LNW Research.....	31	117 Saturn Systems.....	40
323 C.T.S. Inc. of Virginia.....	97	355 Leading Edge Products.....	CIV	375 Semi Disk Systems.....	62
* Cawthon Scientific Group.....	45	463 Legend Industries.....	140	296 Sierra Data Sciences.....	148
170 Chips & Dale.....	32	* Library of Comp. & Info. Sciences.....	23	359 Simpliway Products Company.....	97
484 Columbia Software.....	150	373 Logical Devices, Inc.....	24	* Sinclair Research Ltd.....	9-11
* Commerce Tours.....	160	316 MFJ Enterprises, Inc.....	99	* Snappware, Inc.....	46
315 Compleat Systems.....	105	335 Macrotech International.....	41	498 Software Connection Inc.....	152
90 CompuCover.....	103	234 Magnolia Microsystems Inc.....	75	302 Software Connection, The.....	106
371 CompuServe.....	28	494 Management Information Services.....	150	294 Software Support.....	153
320 Computer Case Company.....	29	95 Manx Software Systems.....	29	357 Software Toolworks, The.....	102
18 Computer Design Labs.....	77	447 Mark of the Unicorn.....	140	497 Software Toolworks, The.....	152
384 Computer Mail Order.....	67	477 Mast Development Company.....	147	451 Sorcim Corp.....	140
362 Computer Plus.....	103	165 Med Systems Software.....	80	208 Southwestern Data Systems.....	21
110 Computer Products & Peripherals.....	92	333 Memotech Corporation.....	13	217 Standard Software Corporation of America.....	111
298 Computer Shoppe, The.....	79	473 Micom System, Inc.....	142	237 States Computers.....	147
36 Computer Shopper.....	25	450 Micro Architect Inc.....	140	181 Supersoft Inc.....	93
297 Concord Computer Products.....	116	* Microcomputing Books.....	112-114	244 Supersoft Inc.....	139
292 Coosol, Inc.....	12	* Microcomputing Binders.....	103	288 Syncom.....	49
197 Cornucopia Software.....	145	* Microcomputing Dealers.....	145	189 Tab Sales Company.....	86
252 Cuesta Systems.....	89	* Microcomputing Shelf Boxes.....	102	350 Tatum Labs.....	99
465 Cuesta Systems Inc.....	144	* Microcomputing Subscriptions.....	35, 89	459 Tecmar Inc.....	140
456 Curtis Manufacturing.....	140	308 Micro 80, Inc.....	34	* Tektronix.....	17
356 Curtis Mfg. Company.....	65	216 Microflash Inc.....	75, 103	65 Teletek Inc.....	CIII
462 DG Electronics Developments Co.....	140	* Micro Ink, Inc.....	141	328 Texas Computer Systems.....	111
293 D & N Micro Products.....	27	* Micro Instructional, Inc.....	3, 36	445 Timex Computer Corp.....	144
199 D & W Associates.....	145	480 Micro Logic Corporation.....	168	483 Tri-L Data Systems.....	150
* Daman.....	75	100 Micro Management Systems.....	97	* Toppers.....	39
458 Datamac Computer Systems.....	140	347 Micro Mint, Inc.....	24	478 USI International.....	149
460 Davong Systems Inc.....	140	68 Micro Resources Corp.....	151	399 Unified Software Systems.....	28
475 Davong Systems Inc.....	140	* Micro Technical Products.....	81	* University Microfilm.....	103
471 Digital Equipment Corp.....	142	268 Micro Technology.....	99	285 Vespa Computers.....	97
* Digital Research Computers.....	118, 119	144 Midwest Scientific Instruments.....	18, 19	482 Visicorp.....	150
250 Discount Software Group.....	73	* Mikos.....	117	158 Vynet Corporation.....	75
453 ES/Omicron.....	140	255 Miller Microcomputer Service.....	158	122 WSR Software Assoc.....	79, 97
60 Eastern House Software.....	79	238 Mini Micro Mart.....	157	* Wameco, Inc.....	117
82 Ecosoft.....	56	457 NEC Information Systems.....	140	* Wayne Green Books.....	88
254 Educational Microcomputer System.....	73	466 Nanos Systems Corp.....	146	* Wayne Green International.....	102
169 Elcomp Publishing, Inc.....	156	* National Computer Survey.....	47	* Weather Satellite.....	33
25 Electronics Center.....	33	* Netronics R & D Ltd.....	83, 115	455 Whitney Educational Services.....	140
93 Electronic Specialists, Inc.....	51	286 Nibble Magazine.....	87	163 Wintek Corporation.....	83
* Encyclopedia for the TRS-80.....	111	201 Omega Microware.....	53	* World Wide Media.....	89
116 Escon Products, Inc.....	22	310 Omni Resources.....	5	114 X & Y Enterprises.....	103
83 Etronix.....	73	140 Omnitek Systems.....	51, 160	467 X & Y Enterprises.....	144
				464 Xebec.....	147

*This advertiser prefers to be contacted directly.

For further information from our advertisers, please use the Reader Service card.

STATIC RAMS

			Each	100 pcs
2101	256 x 4	(450ns)	1.95	1.85
5101	256 x 4	(cmos) (450ns)	4.95	3.95
2102-1	1024 x 1	(450ns)	.89	.85
2102L-2	1024 x 1	(LP) (250ns)	1.69	1.55
2102L-4	1024 x 1	(LP) (450ns)	1.29	1.15
2111	256 x 4	(450ns)	2.99	2.49
2112	256 x 4	(450ns)	2.99	2.79
2114	1024 x 4	(450ns)	8/16.95	1.95
2114L-2	1024 x 4	(LP) (200ns)	8/19.95	2.35
2114L-3	1024 x 4	(LP) (300ns)	8/18.95	2.25
2114L-4	1024 x 4	(LP) (450ns)	8/17.95	2.10
2147	4096 x 1	(55ns)	9.95	call
TMS4044-4	4096 x 1	(450ns)	3.49	3.25
TMS4044-3	4096 x 1	(300ns)	3.99	3.75
TMS40L44-2	4096 x 1	(LP) (200ns)	4.49	4.25
MK4118	1024 x 8	(250ns)	9.95	call
TMM2016	2048 x 8	(150ns)	call	call
HM6116-4	2048 x 8	(cmos) (200ns)	call	call
HM6116-3	2048 x 8	(cmos) (150ns)	call	call
HM6116-2	2048 x 8	(cmos) (120ns)	call	call
HM6116LP-4	2048 x 8	(LP) (cmos) (200ns)	call	call
HM6116LP-3	2048 x 8	(LP) (cmos) (150ns)	call	call
HM6116LP-2	2048 x 8	(LP) (cmos) (120ns)	call	call
Z-6132	4096 x 8	(Qstat) (300ns)	34.95	call

LP = Low Power

Qstat = Quasi-Static

DYNAMIC RAMS

			Each	100 pcs
TMS4027	4096 x 1	(250ns)	2.50	2.00
MK4108	8192 x 1	(200ns)	1.95	call
MM5298	8192 x 1	(250ns)	1.85	call
4116-120	16384 x 1	(120ns)	8/29.95	call
4116-150	16384 x 1	(150ns)	8/18.95	1.95
4116-200	16384 x 1	(200ns)	8/13.95	call
4116-250	16384 x 1	(250ns)	8/13.90	call
4116-300	16384 x 1	(300ns)	8/13.80	call
2118	16384 x 1	(5v) (150ns)	4.95	call
MK4816	2048 x 8	(5v) (300ns)	24.95	call
4164-200	65536 x 1	(5v) (200ns)	call	call
4164-150	65536 x 1	(5v) (150ns)	call	call

EPROMS

			Each	8 pcs
1702	256 x 8	(1us)	4.95	4.50
2708	1024 x 8	(450ns)	3.75	3.50
2758	1024 x 8	(5v) (450ns)	9.95	8.95
TMS2516	2048 x 8	(5v) (450ns)	6.95	5.95
2716	2048 x 8	(5v) (450ns)	4.95	3.95
2716-1	2048 x 8	(5v) (350ns)	9.00	8.50
TMS2716	2048 x 8	(450ns)	9.95	8.95
TMS2532	4096 x 8	(5v) (450ns)	9.95	7.95
2732	4096 x 8	(5v) (450ns)	9.95	7.95
2732A-2	4096 x 8	(5v) (200ns)	call	call
2764	8192 x 8	(5v) (450ns)	call	call
TMS2564	8192 x 8	(5v) (450ns)	call	call

5v = Single 5 Volt Supply

EPROM ERASERS

	Timer	Capacity Chip	Intensity (uW/CM ²)	
PE-14		6	5,200	83.00
PE-14T	X	6	5,200	119.00
PE-24T	X	9	6,700	175.00
PL-265T	X	20	6,700	255.00
PR-125T	X	16	15,000	349.00
PR-320T	X	32	15,000	595.00

JULY SPECIALS

2K x 8 STATIC

TMM-2016 (200NS)

8/6⁹⁵ EA.

HM6116 (200NS)

8/7⁹⁵ EA.

64K DYNAMIC

4164 (200NS)

8/8⁹⁵ EA.

16K DYNAMIC

4116 (200NS)

8/13⁹⁵ EA.

16K EPROMS

2716 (450NS)

8/3⁹⁵ ea.

32K EPROMS

2532 or 2732

(450NS)

8/7⁹⁵ EA.PRICES GOOD FOR THE MONTH OF JULY ONLY. PLEASE
MENTION JULY SPECIALS WHEN ORDERING.

PROMS

EQUIVALENT PART NUMBERS

Order by National	Part No.	Function	TI	SIG	MMI	Harris
74S188	32x8 OC	18SA030	82S23	6330-1	7602	2.95
74S287	256x4 TS	14S10	82S129	6301-1	7611	3.25
74S288	32x8 TS	18S030	82S123	6331-1	7603	2.75
74S387	256x4 OC	14SA10	82S126	6300-1	7610	2.95
74S471	256x8 TS	18S22		6309-1		10.95
74S472	512x8 TS	18S42	82S147	6349-1	7649	10.95
74S473	512x8 OC	18SA42	82S146	6348	7648	10.95
74S474	512x8 TS	18S46	82S141	6341	7641	12.95
74S475	512x8 TS	18SA46	82S140	6340	7640	12.95
74S478	1Kx8 TS	28S86				19.95
74S570	512x4 OC	27S12	82S130	6305	7620	5.95
74S571	512x4 TS	27S13	82S131	6306-1	7621	5.95
74S572	1Kx4 OC	24SA41	82S136	6352-1	7642	9.95
74S573	1Kx4 TS	24S41	82S137	6353-1	7643	9.95
87S180	1Kx8 OC	28SA86	82S180	6380-1	7680	19.25
87S181	1Kx8 TS	28S86	82S181	6381-1		17.20
87S184	2Kx4 OC	24SA81	82S184			16.95
87S185	2Kx4 TS	24S81	82S185			16.95
87S190	2Kx4 OC	28SA166	82S190			39.95
87S191	2Kx8 TS	28S166	82S191			39.95

74LS00 SERIES

74LS00	.25	74LS169	1.75
74LS01	.25	74LS170	1.75
74LS02	.25	74LS173	.80
74LS03	.25	74LS174	.95
74LS04	.25	74LS175	.95
74LS05	.25	74LS181	2.15
74LS08	.35	74LS189	9.95
74LS09	.35	74LS190	1.00
74LS10	.25	74LS191	1.00
74LS11	.35	74LS192	.85
74LS12	.35	74LS193	.95
74LS13	.45	74LS194	1.00
74LS14	1.00	74LS195	.95
74LS15	.35	74LS196	.85
74LS20	.25	74LS197	.85
74LS21	.35	74LS221	1.20
74LS22	.25	74LS240	1.29
74LS26	.35	74LS241	1.29
74LS27	.35	74LS242	1.85
74LS28	.35	74LS243	1.85
74LS30	.25	74LS244	1.29
74LS32	.35	74LS245	1.90
74LS33	.55	74LS247	.75
74LS37	.55	74LS248	1.25
74LS38	.35	74LS249	.99
74LS40	.35	74LS251	1.30
74LS42	.55	74LS253	.85
74LS47	.75	74LS257	.85
74LS48	.75	74LS258	.85
74LS49	.75	74LS259	2.85
74LS51	.25	74LS260	.65
74LS54	.35	74LS266	.55
74LS55	.35	74LS273	1.65
74LS63	1.25	74LS275	3.35
74LS73	.40	74LS279	.55
74LS74	.45	74LS280	1.98
74LS75	.50	74LS283	1.00
74LS76	.40	74LS290	1.25
74LS78	.50	74LS293	1.85
74LS83	.75	74LS295	1.05
74LS85	1.15	74LS298	1.20
74LS86	.40	74LS324	1.75
74LS90	.65	74LS352	1.55
74LS91	.89	74LS353	1.55
74LS92	.70	74LS363	1.35
74LS93	.65	74LS364	1.95
74LS95	.85	74LS365	.95
74LS96	.95	74LS366	.95
74LS107	.40	74LS367	.70
74LS109	.40	74LS368	.70
74LS112	.45	74LS373	1.75
74LS113	.45	74LS374	1.75
74LS114	.50	74LS377	1.45
74LS122	.45	74LS378	1.18
74LS123	.95	74LS379	1.35
74LS124	2.99	74LS385	1.90
74LS125	.95	74LS386	.65
74LS126	.85	74LS390	1.90
74LS132	.75	74LS393	1.90
74LS136	.55	74LS395	1.65
74LS137	.99	74LS399	1.70
74LS138	.75	74LS424	2.95
74LS139	.75	74LS447	.37
74LS145	1.20	74LS490	1.95
74LS147	2.49	74LS624	3.99
74LS148	1.35	74LS668	1.69
74LS151	.75	74LS669	1.89
74LS153	.75	74LS670	2.20
74LS154	2.35	74LS674	9.65
74LS155	1.15	74LS682	3.20
74LS156	.95	74LS683	2.30
74LS157	.75	74LS684	2.40
74LS158	.75	74LS685	2.40
74LS160	.90	74LS688	2.40
74LS161	.95	74LS689	2.40
74LS162	.95	74LS783	24.95
74LS163	.95	81LS95	1.69
74LS164	.95	81LS96	1.69
74LS165	.95	81LS97	1.69
74LS166	2.40	81LS98	1.69
74LS168	1.75		

TRANSISTORS

PN2222	10/1.00	100/ 8.99
2N2222	.25	50/10.99
2N2907	.25	50/10.99
2N3055	.79	10/ 6.99
2N3904	10/1.00	100/ 8.99
2N3906	10/1.00	100/ 8.99
1N4148 (1N914)		25/ 1.00
1N4004		10/ 1.00



JDR MICRODEVICES, INC.

1224 S. Bascom Avenue

San Jose, CA 95128

800-538-5000 • 800-662-6279 (CA)

(408) 995-5430 • Telex 171-110

Circle 84 on Reader Service card.

HOURS: Mon. - Fri., 9 to 5; Sat. 11 to 3

VISIT OUR RETAIL STORE!

TERMS: For shipping include \$2.00 for UPS Ground, \$3.00 for UPS Blue Label Air. \$10.00 minimum order. Bay Area residents add 6 1/2% sales tax. California residents add 6% sales tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

Z-80

2.5 Mhz

Z80-CPU	6.00
Z80-CTC	5.95
Z80-DART	15.25
Z80-DMA	17.50
Z80-PIO	6.00
Z80-SIO/O	18.50
Z80-SIO/1	18.50
Z80-SIO/2	18.50
Z80-SIO/9	16.95

4.0 Mhz

Z80-A-CPU	6.00
Z80-CTC	8.65
Z80-A-DART	18.75
Z80-A-DMA	27.50
Z80-A-PIO	6.00
Z80-A-SIO/O	22.50
Z80-A-SIO/1, O	22.50
Z80-A-SIO 1/2	22.50
Z80-A-SIO/9	19.95

6.0 Mhz

Z80B-CPU	17.95
Z80B-CTC	15.50
Z80B-PIO	15.50

ZILOG

Z6132	34.95
Z8	39.95

IC SOCKETS

1-99 100

8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.13
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39

ST = SOLDERTAIL

14 pin WW	.69	.52
16 pin WW	.69	.58
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80

WW = WIREWRAP

8200

8202	34.95
8205	3.50
8212	1.85
8214	3.85
8216	1.80
8224	2.50
8226	1.80
8228	4.90
8237	19.95
8238	4.95
8243	4.45
8250	14.95
8251	4.75
8253	9.25
8253-5	9.85
8255	4.75
8255-5	5.25
8257	8.50
8257-5	8.95
8259	6.90
8259-5	7.50
8272	39.95
8275	29.95
8279	9.50
8279-5	10.00
8282	6.65
8283	6.65
8284	5.70
8286	6.65
8287	6.50
8288	25.00
8289	49.95

CONNECTORS

RS232 MALE	3.25
RS232 FEMALE	3.75
RS232 HOOD	1.25
S-100 ST	3.95
S-100 WW	4.95

DIP SWITCHES

4 POSITION	.85
5 POSITION	.90
6 POSITION	.90
7 POSITION	.95
8 POSITION	.95

8000 SERIES

8035	7.25
8039	7.95
INS8060	17.96
INS8073	29.95
8080	3.95
8085	7.95
8085A-2	11.95
8086	59.95
8087	Call
8088	39.95
8089	89.95
8155	7.95
8156	8.95
8185	29.95
8185-2	39.95
8741	39.95
8748	29.95
8755	32.00

9000 SERIES

9316	1.00
9334	2.50
9368	3.95
9401	9.95
9601	.75
9602	1.50
96502	1.95

DATA ACQUISITION

ADC0800	5.55
ADC0804	4.95
ADC0809	5.25
ADC0817	10.95
DAC0800	4.95
DAC0808	4.95
DAC1020	8.25
DAC1022	5.95
MC1408L8	4.95

6800

68000	call
6800	4.95
6802	10.95
6808	13.90
6809E	19.95
6809	19.95
6810	2.95
6820	4.95
6821	4.95
6828	14.95
6840	12.95
6843	34.95
6844	25.95
6845	16.95
6847	12.25
6850	3.45
6852	5.75
6860	10.95
6862	11.95
6875	6.95
6880	2.95
6883	24.95
68047	24.95
68488	19.95
68B00	10.95
68B02	22.25
68B09E	29.95
68B09	29.95
68B10	7.95
68B21	12.95
68B45	35.95
68B50	12.95

6800 = 1 MHZ

68B00 = 2 MHZ

6500 SERIES

1 MHZ

6502	6.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	8.75
6532	11.25
6545	22.50
6551	11.85

2 MHZ

6502A	9.95
6522A	11.70
6532A	12.40
6545A	28.50
6551A	12.95

3 MHZ

6502B	14.95
-------	-------

CRYSTALS

32.768 khz	3.95
1.0 mhz	4.95
1.8432	4.95
2.0	3.95
2.097152	3.95
2.4576	3.95
3.2768	3.95
3.579535	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
5.9904	3.95
6.0	3.95
6.144	3.95
6.5536	3.95
8.0	3.95
10.0	3.95
14.31818	3.95
15.0	3.95
16.0	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95
32.0	3.95

INTERSIL

ICL7103	9.50
ICL7106	9.95
ICL7107	12.95
ICL8038	3.95
ICM7107A	5.59
ICM7208	15.95

DISC CONTROLLERS

1171	24.95
1791	36.95
1793	44.95
1795	54.95
1797	54.95
6843	42.95
8272	39.95
UPD765	39.95
1691	18.95
2143	18.95

INTERFACE

8T26	1.69
8T28	2.49
8T95	.99
8T96	.99
8T97	.99
8T98	.99
DM8131	2.95
DP8304	2.29

MISC

3341	4.95
76477	3.95
AY3-8910	12.95
MC3340	1.49
95H90	7.99
11C90	13.95
8202A	34.95
3242	7.95
MC3480	9.00
MC4024	3.95
MC4044	4.50
3205	3.50

BIT-RATE GENERATORS

14411	9.95
BR1941	9.95
4702	12.95
COM5016	16.95
MM5307	10.95

UARTS

AY3-1014	6.95
AY5-1013	3.95
PT1472	9.95
TR1602	3.95
2350	9.95
TMS6011	5.95
IM6402	7.95
IM6403	8.95
INS8250	14.95

KEYBOARD CHIPS

AY5-2376	11.95
AY5-3600	11.95
74C922	5.25
74C923	5.50

ORDER TOLL FREE
800-538-5000
800-662-6279
CALIFORNIA RESIDENTS

LINEAR

LM301	.34	LM350K	5.60	NE570	4.75
LM301H	.79	LM350T	4.60	NE571	3.95
LM307	.45	LM358	.98	NE592	2.75
LM308	.98	LM359	1.79	LM703	.89
LM308H	1.15	LM376	3.75	LM709	.59
LM309H	1.95	LM377	2.29	LM710	.75
LM309K	1.49	LM378	2.50	LM711	.79
LM310	1.75	LM379	4.50	LM723	.49
LM311	.64	LM380	1.29	LM723H	.55
LM311H	.89	LM380N-8	1.10	LM733	.98
LM312H	1.75	LM381	1.60	LM741N-8	.35
LM317K	3.95	LM382	1.60	LM741N-14	.35
LM317	1.95	LM383	1.95	LM741H	.40
LM318	1.49	LM384	1.95	LM747	.79
LM318H	1.59	LM386	1.50	LM748	.59
LM319H	1.25	LM387	1.40	LM1014	2.75
LM319	1.25	LM389	1.35	LM1303	1.95
LM320 (see 7900)		LM390	1.95	LM1304	1.19
LM322	1.65	LM392	.69	LM1305	1.49
LM323K	4.95	LM394H	3.60	LM1307	.85
LM324	.59	LM399H	5.00	LM1310	2.90
LM329	.69	NE531	3.75	MC1330	1.89
LM331	3.95	NE536	6.00	MC1349	1.89
LM334	1.30	NE555	.39	MC1350	1.29
LM335	1.40	NE556	.69	MC1358	1.79
LM336	1.75	NE558	1.50	LM1414	1.59
LM337K	3.95	NE561	19.95	LM1458	.69
LM337T	2.95	NE562	6.00	LM1488	.99
LM338K	6.95	NE564	3.95	LM1489	.99
LM339	.99	LM565	.99	LM1496	.85
LM340 (see 7800)		LM566	1.49	LM1558H	3.10
LM348	1.20	LM567	1.29		

BI FET

TL071	.79
TL072	1.19
TL074	2.19
TL081	.79
TL082	1.19
TL083	1.19
TL084	2.19
LF347	2.19
LF351	.60
LF353	1.00
LF355	1.10
LF356	1.10
LF357	1.40

EXAR

XR 2206	3.75
XR 2207	3.85
XR 2208	3.90
XR 2211	5.25
XR 2240	3.25

RCA

CA 3010	.99
CA 3013	2.00
CA 3023	2.75
CA 3035	2.45
CA 3039	1.25
CA 3046	1.25
CA 3053	1.45
CA 3059	2.90
CA 3060	2.90
CA 3065	1.75
CA 3080	1.10
CA 3081	1.65
CA 3082	1.65
CA 3083	1.55
CA 3086	.80
CA 3089	2.95
CA 3096	3.45
CA 3130	1.30
CA 3140	1.15
CA 3146	1.85
CA 3160	1.15
CA 3401	.55
CA 3600	3.45

7400 SERIES

7400	.19	74136	.50
7401	.19	74141	.65
7402	.19	74142	2.95
7403	.19	74143	2.95
7404	.19	74145	.60
7405	.25	74147	1.75
7406	.29	74148	1.20
7407	.29	74150	1.35
7408	.24	74151	.65
7409	.19	74152	.65
7410	.19	74153	.55
7411	.25	74154	1.40
7412	.30	74155	.75
7413	.35	74156	.65
7414	.55	74157	.55
7416	.25	74159	1.65
7417	.25	74160	.85
7420	.19	74161	.70
7421	.35	74162	.85
7422	.29	74163	.85
7423	.29	74164	.85
7425	.29	74165	.85
7426	.29	74166	1.00
7427	.29	74167	2.95
7428	.45	74170	1.65
7430	.19	74172	5.95
7432	.29	74173	.75
7433	.45	74174	.89
7437	.29	74175	.89
7438	.29	74176	.89
7440	.19	74177	.75
7442	.49	74178	1.15
7443	.65	74179	1.75
7444	.69	74180	.75
7445	.69	74181	2.25
7446	.59	74182	.75
7447	.69	74184	2.00
7448	.69	74185	2.00
7450	.19	74186	18.50
7451	.23	74190	1.15
7453	.23	74191	1.15
7454	.23	74192	.79
7460	.23	74193	.79
7470	.35	74194	.85
7472	.29	74195	.85
7473	.34	74196	.79
7474	.35	74197	.75
7475	.49	74198	1.35
7476	.35	74199	1.35
7480	.59	74221	1.35
7481	1.10	74246	1.35
7482	.95	74247	1.25
7483	.50	74248	1.85
7485	.65	74249	1.95
7486	.35	74251	.75
7489	4.95	74259	2.25
7490	.35	74265	1.35
7491	.40	74273	1.95
7492	.50	74276	1.25
7493	.49	74279	.75
7494	.65	74283	2.00
7495	.55	74284	3.75
7496	.70	74285	3.75
7497	2.75	74290	.95
74100	1.00	74293	.75
74107	.30	74298	.85
74109	.45	74351	2.25
74110	.45	74365	.65
74111	.55	74366	.65
74116	1.55	74367	.65
74120	1.20	74368	.65
74121	.29	74376	2.20
74122	.45	74390	1.75
74123	.55	74393	1.35
74125	.45	74425	3.15
74126	.45	74426	.85
74128	.55	74490	2.55
74132	.45		

CMOS

74C00	.35	4019	.45
74C02	.35	4020	.95
74C04	.35	4021	.95
74C08	.35	4022	1.15
74C10	.35	4023	.35
74C14	1.50	4024	.75
74C20	.35	4025	.35
74C30	.35	4026	1.65
74C32	.50	4027	.65
74C42	1.75	4028	.80
74C48	1.20	4029	.95
74C73	.65	4030	.45
74C74	.85	4034	2.95
74C76	.80	4035	.85
74C83	1.95	4040	.95
74C85	1.95	4041	1.25
74C86	.95	4042	.75
74C89	4.50	4043	.85
74C90	1.75	4044	.85
74C93	1.75	4046	.95
74C95	1.75	4047	.95
74C107	1.00	4049	.55
74C150	5.75	4050	.55
74C151	2.25	4051	.95
74C154	3.25	4053	.95
74C157	1.75	4060	1.45
74C160	2.00	4066	.75
74C161	2.00	4068	.40
74C162	2.00	4069	.35
74C163	2.00	4070	.35
74C164	2.00	4071	.30
74C165	2.00	4072	.30
74C173	2.00	4073	.30
74C174	2.25	4075	.30
74C175	2.25	4076	.95
74C192	2.25	4078	.30
74C193	2.25	4081	.30
74C195	2.25	4082	.30
74C200	5.75	4085	.95
74C221	2.25	4086	.95
74C373	2.75	4093	.95
74C374	2.75	4098	2.49
74C901	.80	4099	1.95
74C902	.85	14409	12.95
74C903	.85	14410	12.95
74C905	10.95	14411	11.95
74C906	.95	14412	12.95
74C907	1.00	14419	4.95
74C908	2.00	4502	.95
74C909	2.75	4503	.65
74C910	9.95	4508	1.95
74C911	10.00	4510	.95
74C912	10.00	4511	.95
74C914	1.95	4512	.95
74C915	2.00	4514	1.25
74C918	2.75	4515	2.25
74C920	17.95	4516	1.55
74C921	15.95	4518	1.25
74C922	5.59	4519	1.25
74C923	5.95	4520	1.25
74C925	6.75	4522	1.25
74C926	7.95	4526	1.25
74C927	7.95	4527	1.95
74C928	7.95	4528	1.25
74C929	19.95	4531	.95
74C930	19.95	4532	1.95
4000	.35	4538	1.95
4001	.35	4539	1.95
4002	.25	4543	2.70
4006	.95	4555	.95
4007	.29	4556	.95
4008	.95	4581	1.95
4009	.45	4582	1.95
4010	.45	4584	.95
4011	.35	4584	.95
4012	.25	4702	12.95
4013	.45	4724	1.50
4014	.95	80C07	.95
4015	.95	80C95	.85
4016	.45	80C96	.95
4017	1.15	80C97	.95
4018	.95	80C98	1.20

74S00 SERIES

74S00	.44	74S85	2.39	74S163	3.75	74S280	2.90
74S02	.48	74S86	1.44	74S168	4.65	74S287	4.75
74S03	.48	74S112	1.59	74S169	5.44	74S288	4.45
74S04	.79	74S113	1.98	74S174	1.09	74S289	6.98
74S05	.79	74S114	1.50	74S175	1.09	74S301	6.95
74S08	.48	74S124	2.77	74S181	4.47	74S373	3.45
74S09	.98	74S132	1.24	74S182	2.95	74S374	3.45
74S10	.69	74S133	.98	74S188	3.95	74S381	7.95
74S11	.88	74S134	.69	74S189	14.95	74S387	5.75
74S15	.70	74S135	1.48	74S194	2.95	74S412	2.98
74S20	.68	74S138	1.08	74S195	1.89	74S471	9.95
74S22	.98	74S139	1.25	74S196	4.90	74S472	16.85
74S30	.48	74S140	1.45	74S197	4.25	74S474	17.85
74S32	.98	74S241	3.75	74S201	14.95	74S482	15.60
74S37	1.87	74S244	3.98	74S225	8.95	74S570	7.80
74S38	1.68	74S251	1.90	74S240	3.98	74S571	7.80
74S40	.44	74S253	7.45	74S257	1.39		
74S51	.78	74S157	1.19	74S258	1.49		
74S64	.79	74S158	1.45	74S260	1.83		
74S65	1.25	74S161	2.85	74S274	19.95		
74S74	.69	74S162	3.70	74S275	19.95		

EPSON PRINTERS

MX-80

~~479⁰⁰~~

MX-80/FT

~~579⁰⁰~~

MX-100

~~775⁰⁰~~CALL FOR
THE LOWEST PRICES16K APPLE*
RAM CARD

- ★ Upgrade your 48K Apple* II to full 64K.
- ★ Fully software and hardware compatible with Apple language card and microsoft Z80 card.
- ★ Eliminates the need for Applesoft or Integer Basic ROM card when used in conjunction with DOS 3.3
- ★ Allows you to run Apple Fortran or Pascal.
- ★ Available as bare board kit, or completed and tested board.

BARE BOARD \$ 40.00
 KIT 89.95
 ASSEMBLED &
 TESTED 109.95

*Apple is a trademark of APPLE COMPUTER INC.

LED DISPLAYS

1.29	HP 5082-7760	.6"	CC	14 Pin 3"
.99	MAN 72	.3"	CA	14 Pin .3"
.99	MAN 74	.3"	CC	14 Pin .3"
.75	FND-357 (359)	.375"	CC	10 Pin .2"
.99	FND-500 (503)	.5"	CC	10 Pin .6"
.99	FND-507 (510)	.5"	CA	10 Pin .6"

LED LAMPS

		1-99	100-up
Jumbo Red	.10	.09	
Jumbo Green	.18	.15	
Jumbo Yellow	.18	.15	



JDR MICRODEVICES, INC.

1224 S. Bascom Avenue
 San Jose, CA 95128

800-538-5000 • 800-662-6279 (CA)
 (408) 995-5430 • Telex 171-110

Circle 84 on Reader Service card.

HOURS: Mon. - Fri., 9 to 5; Sat. 11 to 3

VISIT OUR RETAIL STORE!

TERMS: For shipping include \$2.00 for UPS Ground, \$3.00 for UPS Blue Label Air. \$10.00 minimum order. Bay Area residents add 6 1/2% sales tax. California residents add 6% sales tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

ZENITH MONITOR

MODEL ZVM-121

- * 12" P-31 Green phosphor
- * SELECTABLE 40 or 80 CHARACTERS PER LINE
- * 15 MHZ BANDWIDTH

\$119⁹⁵

ORDER TOLL FREE

800-538-5000**800-662-6279**

(CALIFORNIA RESIDENTS)

.....●●●●●●●●●●
**We Will
 Beat Any
 Competitors
 Prices**

●●●●●●●●●●
 A copy of this policy is
 available upon request.

A LETTER FROM THE PRESIDENT.....

At JDR Microdevices, Inc. 100% customer satisfaction is our goal! Our first priority is to make sure that all of our customers receive our world famous JDR service:

GUARANTEED LOWEST PRICES!

If you see an item advertised elsewhere for less, tell us - we will match or beat their price.*

FRIENDLY STAFF!

To make doing business with JDR a pleasant experience.

SPEEDY SERVICE!

To speed your order on its way in one day with superb accuracy.

To better help us serve the needs of our customers, we have installed a new IBM System 34 Computer. This will enable us to reach our goal of 100% Customer Satisfaction, but we need your help - please use your customer number whenever ordering. Your permanent customer number can be found on the left-hand side of your computer printed invoice.

I would like to take this opportunity to thank all of our customers for making JDR one of the fastest growing electronic firms in the world!

Jeffery D. Rose

* A copy of this policy is available upon request.

DISKETTES**5¼"**

ANTHANA SS SD SOFT 24.95

WABASH SS SD SOFT 24.95

VERBATIM SS SD SOFT 29.95

VERBATIM 10 SECTION HARD... 29.95

8"

VERBATIM SS SD SOFT 44.95

**BOOKS
BEST SELLERS****OSBORNE/MC GRAW-HILL**

Apple II User's Guide 14.95
 CRT Controller's Handbook 6.99
 68000 Assembly Language
 Programming 16.99
 CBASIC User Guide 15.00
 The 8086 Book 16.99

SYBEX

Your First Computer 8.95
 The CP/M Handbook 14.95
 From Chips to Systems 14.95
 The PASCAL Handbook 18.95
 Microprocessor Interfacing
 Techniques 17.95

**APPLE* FAN****\$69⁰⁰**

- OUTLET ON THE REAR OF THE FAN FOR A MONITOR - CONTROLLED BY THE SWITCH
- ULTRA-QUIET APPLE FAN DRAWS COOL AIR THROUGH YOUR COMPUTER
- ELIMINATES DOWN TIME
- SAVES REPAIR CHARGES
- INCREASES RELIABILITY
- CLIPS ON—NO HOLES OR SCREWS
- LONG LIFE, LOW NOISE MOTOR

*Apple is a trademark of APPLE COMPUTER, INC.

**ADD ON
 DISK
 DRIVE**
For Apple* II

- ★ Includes metal cabinet
- ★ Color matches Apple*
- ★ 35 Tracks/single side
- ★ Includes cable
- ★ Use with Apple* II Controller

\$375⁰⁰

HOURS: Mon. - Fri., 9 to 5; Sat. 11 to 3

VISIT OUR RETAIL STORE!

TERMS: For shipping include \$2.00 for UPS Ground, \$3.00 for UPS Blue Label Air. \$10.00 minimum order. Bay Area residents add 6½% sales tax. California residents add 6% sales tax. We reserve the right to limit quantities and substitute manufacturer. Prices subject to change without notice. Send SASE for complete list.

**JDR MICRODEVICES, INC.**

1224 S. Bascom Avenue
 San Jose, CA 95128

800-538-5000 • 800-662-6279 (CA)
 (408) 995-5430 • Telex 171-110

Circle 84 on Reader Service card.

Basic Training Camp

Lake Forest College will sponsor a series of one-week computer camp sessions from June 20-Aug. 6. The sessions are open to all youngsters 12 to 18 years old and will focus on the Basic language.

For more information contact Dr. Lowell Carmony, Associate Professor of Mathematics and Computer Studies, Lake Forest College, Lake Forest, IL 60045. 312-234-3100.

National Computer Camp

National Computer Camp will be held in Simsbury, CT, from July 11-Aug. 16 for youngsters ages ten to 18. In addition to learning about computers, children will have an opportunity to enjoy recreational activities including swimming and tennis.

For more information contact Michael Zabinski, Ph.D., National Computer Camp, PO Box 624, Orange, CT 06477. 203-795-3049.

Peripherals '82

The first International Peripheral Equipment and Software Exposition (Peripherals '82) will be held Sept. 29, 30 and Oct. 1 at the Anaheim Convention Center, Anaheim, CA.

For more information on exhibiting or visiting Peripherals '82 contact Cahners Exposition Group, 222 West Adams St., Chicago, IL 60606. 312-263-4866, Telex: 256148.

Origins '82

Origins '82, the eighth annual national Adventure Gaming show, will be held July 23-25 at the University of Maryland, Baltimore, MD. This gaming convention will include exhibitions, tournaments, seminars and demonstrations.

For more information contact Origins '82, PO Box 15405, Baltimore, MD 21220. 301-539-4634.

PerCompAsia 82

The first Southeast Asian personal computer hardware and software show will be held October 20-23 at the Hyatt Convention Center in Singapore.

For further information contact Overseas Exhibition Services Ltd., 11 Manchester Square, London, W1M 5AB, England. Telephone: 01-486 1951, Telex: 24591 Montex.

The Fifth Annual Personal Computer World Show

The fifth annual Personal Computer World Show will be held at Barbican Centre, London, England, Sept. 9-12 and will include a wide range of exhibits oriented toward the business, scientific, educational and hobbyist markets.

For more information contact Tim Collins, Montbuild Ltd., 11 Manchester Square, London W1M 5AB. Telephone: 01-486 1951, Telex: 24591, Montex G.

Computer Camp, Inc.

Computer Camp, Inc. will hold five two-week sessions this summer at each of their three campsites—Santa Barbara, CA, Cape Cod, MA, and Lake Tahoe, CA. Campers will have an opportunity to learn Basic, the principles of electronics, advanced languages (Pascal, Fortran, assembly language and Lisp), ar-

tificial intelligence and robotics. In addition, recreational activities such as swimming, tennis, soccer, hiking and sailing will be offered. Youngsters ages 7-16 may attend. Each two-week session is \$795.

Computer Camp, Inc. also offers week-long seminars for adults at the Club Med resort in Ixtapa, Mexico and at the El Encanto Hotel, Santa Barbara, CA. These seminars focus on general microcomputer applications.

For further information contact Computer Camp, Inc., 1235 Coast Village Rd., Suite G, Santa Barbara, CA 93108. 805-969-7871 or 800-235-6965.

Logo Courses

Logo, The Computer Learning Center, is offering courses and a computer day camp this summer. The camp and the courses are one week long and are offered ten times throughout the summer.

For more information contact Logo, The Computer Learning Center, 989 Avenue of the Americas, New York, NY 10018. 212-564-6020.

ACM-IEEE Fifteenth Annual Workshop on Microprogramming

The fifteenth annual workshop on microprogramming (MICRO-15) jointly sponsored by ACM, SIGMICRO and IEEE TC-MICRO will be held October 5-7, in Palo Alto, CA.

A tutorial covering current issues in firmware engineering will be presented on the preceding day, October 4, by Dr. Ted Lewis.

For more information contact Dr. Joseph Fisher, MICRO-15 Program Chairman, Yale University, Box 2158, Yale Station, New Haven, CT 06520.

Second International Computer Engineering Conference and Show

The Computer Engineering Division of the American Society of Mechanical Engineers (ASME) will hold the second International Computer Engineering Conference and Show at the Sheraton Harbor Island Hotel, San Diego, CA, August 15-19. Sixty panel and paper sessions covering the full spectrum of computer topics of interest to engineers are planned along with telecommunication events, poster sessions and student activities. A computer show will be conducted in conjunction with this conference in the exhibit hall adjacent to the conference area. A few of the technical sessions are: computer-aided design, finite element techniques, computers in automotive industry, interactive graphics, computer-aided manufacturing, computers in education and computers in energy systems.

For further information contact Walter Mockert, ASME Headquarters, 345 E. 47th St., New York, NY 10017. 212-644-8032 or Dan Goetschel, Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics, Rensselaer Polytechnic Institute, Troy, NY 12181. 518-270-6471.

Microcomputer Applications in Education—Univ. of Nevada

Microcomputer Applications in Education for teachers and administrators is a continuing education workshop sponsored by the University of Nevada-Reno Division of Continuing Education and the Washoe County School District. It will be held at Cloud's Cal-Neva, August 1-4.

For further information contact Shirley Beck, Division of Continuing Education, Reno, NV 89557. 702-784-4801.

The Computer: Extension of the Human Mind

The College of Education, University of Oregon, Eugene, OR, will hold its third annual summer conference, "The Computer: Extension of the Human Mind," July 21-23 at the Eugene Hilton Hotel and conference center. National leaders in the field of computer science and in computer manufacturing will explore the current state of computers in education and provide a glimpse of future trends. A variety of computers will be displayed and operated and group discussion sessions will be held.

Registration and program details may be obtained by writing '82 Summer Conference, Jude Ridge, College of Education, University of Oregon, Eugene, OR 97402. 503-686-3405.

Welch Academy Computer Camp

Computer camp will be held at J. Hamilton Welch Academy, Ft. Myers, FL, June 14 to Aug. 13 for children ages 8 to 14. Out of town students will live with selected families of local students. The camp's emphasis will be on computers but recreation such as swimming, movies and music instructions will also be available. Cost is \$125 per week or \$500 per month and includes tuition, room, board and all learning materials. The camp is fully accredited by the Southern Association of Colleges and Schools.

Write for details to Registrar, J. Hamilton Welch Academy, 3049 McGregor Blvd., Fort Myers, FL 33901. 813-334-6044.

New York Apple Fair

The Big Apple Users Group of New York will hold its third annual Apple Fair on Aug. 21 at the New York University campus (40 West Fourth St., NYU, Tisch Hall) from 10 AM to 5 PM. The theme of the fair will stress both business and leisure applications of Apple hardware and software. The event is free.

The program will include general business application classes and lectures on software (VisiCalc, plus various data management and word processing systems) as well as lectures and hands-on activities in the realm of graphics, games and education.

For more information contact Big Apple Users Group, PO Box 490, Bowling Green Station, New York, NY 10274. 914-636-3417.

Fall Conference on Classroom Applications of Computers

Computer-Using Educators will hold the third annual Fall Conference on Classroom Applications of Computers in San Jose, CA, on October 1 and 2.

The schedule includes exhibits as well as workshops and six hour-long sessions covering computer-related classroom activities. Curriculum topics will include all levels of education from preschool through post-secondary.

For more information concerning membership in Computer-Using Educators or the conference write to Don McKell, Conference Coordinator, Computer-Using Educators, PO Box 18547, San Jose, CA 95158.

EdCom '82

The National Computer Conference and Expo for Educators will be held October 21-24 at the L.A. Convention Center, Los Angeles, CA.

EdCom '82 will feature over 200 seminars, workshops, demonstrations, exhibits, and hundreds of computers for in-depth tutorials and hands-on sessions.

Presentation topics designed for educators at all levels of ex-

pertise will include computer-aided instruction, administrative uses, classroom management, programming, research applications, authoring languages and literacy. All of these sessions will be conducted by nationally recognized professionals in the field of computer education.

For more information contact Jayne LaFountain, EdCom '82, 2629 N. Scottsdale Road, Scottsdale, AZ 85257.

IEEE COMPCON Fall '82

COMPCON Fall '82, sponsored by the IEEE, will be held Sept. 20-24 at the Capital Hilton Hotel in Washington, D.C. The topic of this conference will be Computer Networks. COMPCON Fall '82 will provide the forum for the researcher, vendor, user or legislator to explore and exchange ideas on the underlying technologies, applications and public policy issues for the 80s.

For further information contact COMPCON Fall '82, PO Box 639, Silver Spring, MD 20901. 301-589-3386.

Annual Word Processing/Information Systems Expo

The Annual Word Processing/Information Systems Expo (WP/IS) will be held September 21, 22 at the Sheraton-Washington Hotel in Washington, D.C.

For more information please contact either Mary Beth Gouled or Joseph P. Rubel, National Trade Productions, Inc., 9418 Annapolis Road, Lanham, MD 20706. 301-459-8383.

PC + 1—An IBM Personal Computer Convention

PC + 1, the annual convention and exhibition sponsored by Personna, the National Association for users of the IBM PC, will be held Sept. 8-11 at the Golden Nugget Hotel-Casino, Atlantic City, NJ. The convention will feature exhibits of products, programs and games for the IBM Personal Computer user.

For exhibition information contact Atlantic Data Supply Corp., Highway 88, Brick, NJ 08723, 201-840-8778; for Personna membership information contact Personna Computer Association, PO Box 759, Point Pleasant, NJ 08742.

Exhibits are open to the public and cost \$12 if registered or \$15 at the gate.

Microcomputers in Vocational Education Conference

The Microcomputers in Vocational Education Conference will be held August 12-13 at the Sheraton Inn, Madison, WI.

For more information contact Judy Rodenstein or Roger Lambert, 964 Educational Sciences Building, 1025 West Johnson St., Madison, WI 53706. 608-263-4367 or 263-2704.

MICRO QUIZ

(from page 12)

Answer: 13

This program computes the greatest common factor of two positive integers, using Euclid's Algorithm. Successive values of R are 273, 65 and 13.

DEALER DIRECTORY

El Monte, CA

Eagle II and M/ACOM-OSI business computer specialist. Serving greater Los Angeles area with all your business computer needs. In-house service, custom programming, terminals, printers, etc. Open 9 AM-6 PM. **Computer Challenge Corp., 3380 Flair Drive, El Monte, CA 91731.**

N. Hollywood, CA

Wholesale prices to dealers and computer club members! Anadex, Centronics, Corvus, Delta, Diablo, Epson, Godbout, Hayes, IDS, C. Itoh, Micro Pro, Mountain Computer, NEC, Novation, Okidata, Qume, TI, Televideo, Vector Graphic, Vista, Zenith and others. **Patio Computer Sales Co., Suite 204, 5451 Laurel Canyon Blvd., N. Hollywood, CA 91607. 762-0020.**

Riverside, CA

Visit our Computer Support Center for the Inland Empire's largest selection of ICs, books and computer accessories. Open daily. Check our prices and friendly service. **Inland Electro-Mart, 8624 California Ave., Riverside, CA 92504. 687-3776.**

Nokomis, FL

We are the leading area computer

store. We carry Cromemco, Apple, Vector Graphic; printers and terminals. We offer full software support including G/L, A/R, payroll and word processing. **Computer Centre, 909 S. Tamiami Trail, Nokomis, FL 33555. 484-1028.**

Aurora, IL

Microcomputer systems for home or business; peripherals, software, books and magazines. Apple, Hewlett-Packard Series 80 Systems, HP calculators, IDS, Qume, Starwriter printers. **Farnsworth Computer Center, 1891 N. Farnsworth Ave., Aurora, IL 60505. 851-3888.**

Pasadena, MD

Altos, Apple, Osborne, Atari—systems, software, service. Not just another computer store! We're a full-service problem solving center for small businesses. **Computer Crossroads, Inc., 9143G Red Branch Rd., Columbia, MD; 8220 Ritchie Hwy., Pasadena, MD. 730-5513/647-7111.**

Lodi, NJ

Computer hardware: North Star, Zenith, Atari, CBM/PET, Qume, Epson and others. Software: EduWare, Professional Software, Zenith, North

Star, Programma, Personal Software and others. Factory trained service dept. Books, magazines, etc. Full product line on display. **Comtek Electronics, Inc., Rt. 46 West, Lodi, NJ. 472-2440.**

Nashua, NH

Try before you buy! Unlimited demo time on all software for Apple, Atari and IBM. Come see all the latest releases here first. No sales tax! **All Software, DJ Square, Rte. 101A, Merrimack, NH 03054. 883-7000.**

Staten Island, Brooklyn, NY

Computer hardware: North Star, Zenith, Atari, CBM-PET, Qume, Epson and others. Software: EduWare, Professional Software, Zenith, North Star, Programma, Personal Software and others. Factory trained service department. Books, magazines, etc. Full product line on display. **Comtek Electronics Inc., Staten Island Mall, Staten Island, NY. 698-7050; Coney Island Ave. and Ave. X, Brooklyn, NY. 332-5933.**

Akron, OH

Atari video game authorized indepen-

dent servicer. Games serviced by factory trained technicians. Fast turnaround. Dealer inquiries invited. We stock genuine Atari game and joystick parts. **Greensburg Electronics, 2618 Massillon Road, Akron, OH 44312. 644-3178.**

Montreal, Quebec

We do expert service on all microcomputers and peripherals (CRT, printer, floppy disk). North Star, Hazeltine, Cromemco, Centronics, Shugart, Siemens, Apple, TRS, Epson, S-100. **Montreal Data Centre, 120 Ricard, Legardeur, Montreal, Quebec. 585-8801.**

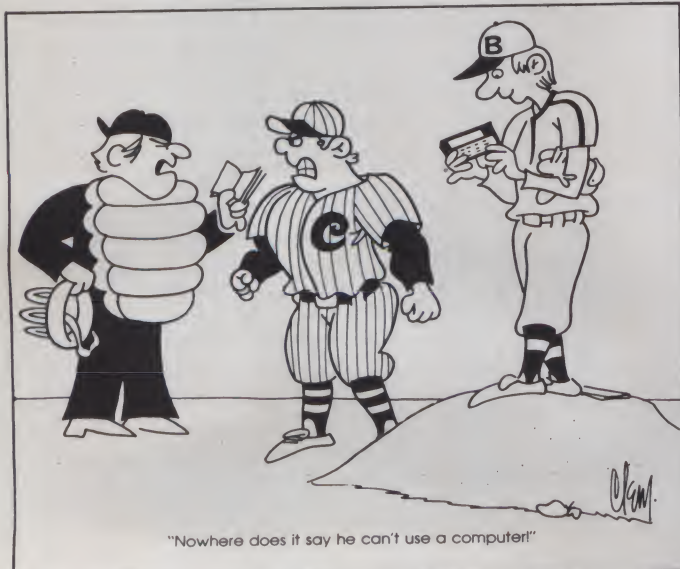
Austin, TX

Try computer classifieds. Buy, sell, trade, employment, etc. No charge to read ads. 300 baud, 24 hours, 512-346-4495. **Oracle Systems, 8348 Summerwood, Austin, TX 78759.**

Woodbridge, VA

Computer/word-processing systems for business, school, home. Software, disk drives, printers. Books, magazines, supplies. Authorized CBM/PET dealer, service. Consulting, training, maintenance contracts. MWF noon-8 PM, Saturday 9 AM-3 PM. **Virginia Micro Systems, Inc., 14415 Jefferson Davis Highway, Woodbridge, VA 22191. 491-6502. Washington Metro 643-1063.**

Dealers: Listings are \$15 per month in prepaid quarterly payments, or one yearly payment of \$150, also prepaid. Ads include 25 words describing your products and services plus your company name, address and phone. (No area codes or merchandise prices, please.) Call Marcia at 603-924-9471 or write *Microcomputing*, Ad Department, Peterborough, NH 03458.



"Nowhere does it say he can't use a computer!"

CLASSIFIEDS

Classified advertisements are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Two sizes of ads are available. The \$5 box allows up to 5 lines of about 35 characters per line, including spaces and punctuation. The \$10 box allows up to 10 lines. Minimize use of capital letters to save space. No special layouts allowed. Payment is required in advance with ad copy. We cannot bill or accept credit.

Advertising text and payment must reach us 60 days in advance of publication (i.e., copy for March issue, mailed in February, must be here by Jan. 1). The publisher reserves the right to refuse questionable or inapplicable advertisements. Mail copy with payment to: **Classifieds, Microcomputing, Peterborough, NH 03458.** Do not include any other material with your ad as it may be delayed.

For sale: DEC LSI-11/2 system 96K mem., 2 RS-232 ports, RX02 1M dual floppy drive, VT103AA CRT terminal, RT-11 op. sys. with Basic-11 floating point math ROM, manuals and software included. Price reduced from \$13,500 to \$8500 now to \$6500. Call Howard C. 801-526-2601.

VIC-20 users unite! Join the VIC-NIC club—a growing group of VIC-20 hobbyists. Send stamp for newsletter, VIC-NIC-NEWS. D. McCormack PO Box 981, Salem, NH 03079.

Historical stock market data on Apple II+ DOS 3.3 diskettes. Daily 1970 to present: (1) DJI (2) NYSE composite (3) S&P 500—all closes. NYSE (4) volume (5) adv, decl, unchanged (6) new high-lows. *Weekly* 1962 to

present: (7) DJI close and NYSE adv, decl, unchanged. \$25 per file (specify 1-7). All files \$150. Satisfaction guaranteed. James Robins, 1115 Highland Oaks, Arcadia, CA 91006.

OSI CIPMF Model 1. 32K RAM. Mini floppy disk and cassette storage. Includes monitor, all connecting cables, software, 20 disks, all manuals and extra documentation. Write Frank Clark, 402 W. Ferry, Berrien Springs, MI 49103.

Used Heath H-8 memory board, I/O card, terminal, software and complete H-8 system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Groton Fall, NY 10519.

Two Great Languages! Two Great Compilers!

Ada*

Required by the Department of Defense for all its programming, Ada is a highly structured, sophisticated language, well suited to both applications and systems programming.

SuperSoft Ada is a native code, fully recursive, two pass compiler which generates ".COM" files. While currently a subset, SuperSoft Ada supports most features of the standard Ada language.

Required by the Department of Defense for Ada copyright protection: "This compiler is presently an incomplete implementation of the Ada programming language. It is intended that this compiler will be further developed to enable implementation of the complete Ada programming language, and then to be submitted to the Ada Joint Program Office for validation."

Because of the DOD requirement, Ada is certain to become a dominant language soon. Begin learning and using Ada now with SuperSoft Ada.

(Requires: 48K CP/M)
Ada Compiler: \$300.00
Manual Only: \$ 25.00

C



Version 1.1 of SuperSoft's widely used C compiler has now been released. With this release SuperSoft's C now includes all the most widely used features of version 7 Unix standard C.

SuperSoft C is a two pass compiler which typically results in 40% code reduction. This means that compiled object code will run nearly as fast as that which was written in assembler. Also, because assembly code is produced, "hand optimization" of critical sections is possible.

(Requires: 48K CP/M, more recommended)
C Compiler: \$250.00
Manual Only: \$ 15.00
8086 C Compiler: \$500.00

Available from fine dealers everywhere, or directly from SuperSoft.

Japanese Distribution:

ASR Corporation
3-23-8, Nishi-Shimbashi, Minato-Ku
Tokyo 105, Japan
Tel. (03)-437-5371
Telex. 0242-2723

*Ada is a trademark of the Department of Defense (Ada Joint Program Office)

CP/M is a registered trademark of Digital Research

Ada and C are available for virtually all CP/M, CP/M 86, and MS DOS compatible systems.

SuperSoft®

FIRST IN SOFTWARE TECHNOLOGY P.O.Box 1628 Champaign, IL 61820 (217) 359-2112 Telex 270365

Circle 244 on Reader Service card.

IBM Support On the Rise

Word Processors, Business Software, Expansion Options

Word Processing

A raft of word processing programs for the IBM PC have appeared. The popular WordStar system, from Professional Micro Systems, Inc., Suite 3000, 4000 MacArthur Blvd., Newport Beach, CA 92660, now runs under IBM's PC-DOS. The same company provides a 20M hard disk to make word and data processing more convenient on the PC. Reader Service number 446.

Mark of the Unicorn, PO Box 423, Arlington, MA 02174, has released its Final Word system; this sophisticated word processor costs \$300. Reader Service number 447.

PowerText for the IBM provides a format file of various document setups; you need only specify that you're sending a memo, letter, etc., and the word processor will automatically format text. This one is sold by Beaman Porter, Inc., Pleasant Ridge Road, Harrison, NY 10528, for \$400. Reader Service number 449.

More Software

Other business-related software for the PC includes an advanced inventory control system from Micro Architect, Inc., 96 Dothan St., Arlington, MA 02174. INV-X requires a dual disk system and a 132-column printer; it's priced at \$298. Reader Service number 450.

SuperCalc, the popular spreadsheet simulator from the Sorcim Corp., 405 Aldo Ave., Santa Clara, CA 95050, makes use of the color capability of the IBM PC. Negative values and diagnostic messages are displayed in red, protected formulas in yellow. Price for SuperCalc is \$295. Reader Service number 451.

Basic Business Software, Inc., PO Box 26311, Las Vegas, NV 89126, has released its IBM Basic Utilities package for the Basic programmer. A number of useful sub-routines are included, and the package costs \$75. Reader Service number 452.

Transplot is available from ES/Omicron, Suite 590, Building 57, Executive Park South, NE, Atlanta, GA 30329. Transplot provides bit image graphics

transfer from IBM screen graphics to an Epson dot matrix printer. Price is \$39. Reader Service number 453.

The PBL Corp., PO Box 599, Wayzata, MN 55391, has announced that The Personal Investor now runs on the IBM PC. This investment software communicates with the Dow Jones News/Retrieval Service, and records stock purchases, dividends and sales of stocks. It costs \$145. Reader Service number 454.

Insight 1000 Plus is an interactive video authoring program, an easy tool for developing and tailoring lessons that incorporate videotape and videodisc players. The program is available from Whitney Educational Services, 1499 Bayshore Highway, Suite 107, Burlingame, CA 94010. Reader Service number 455.

Add-Ons

Hardware enhancements for the IBM PC also abound this month. Curtis Manufacturing, Winchester, NH 03470, has introduced the PC Pedestal. It can be tilted or swivelled for optimal user comfort, and serves as an attractive stand to increase airflow around the computer. It's priced at \$79.95; an optional three-foot extension cable is \$49.95. Reader Service number 456.

A plug-compatible letter-quality printer has been announced by NEC Information Systems, Inc., 5 Militia Drive, Lexington, MA 02173. The Spinwriter Model 3550 offers unmatched versatility, according to the manufacturer. Reader Service number 457.

Communications controllers with either one or two RS-232 ports are available from Datamac Computer Systems, 680 Almanor Ave., Sunnyvale, CA 94086. They allow IBM PC users to connect their systems to selected IBM computers, lab instruments and peripherals. Price is \$139 for the one-line version, \$199 for the two-line controller. Reader Service number 458.

Four new expansion options are offered by Tecmar, Inc., 23600 Mercantile Road, Cleveland, OH 44122. Tecmar's Winchester disk adds 10M of fast fixed-media memory. A 32K-byte memory

card provides battery backup for static memory. Speed Disk is a unique option that simulates a floppy disk using PC-Mate Dynamic RAM. The Base Board uses four Intel 8255 parallel interface chips to provide 96 digital in/digital out lines. Reader Service number 459.

A dual asynchronous serial card adds several new capabilities to the IBM PC, including dumb terminal emulation, serial printer interface and printing with expanded tabs. Available from Davong Systems, Inc., 1061 Terra Bella Ave., Mountain View, CA 94043, the card includes two I/O channels, switch-selectable serial port addressing and four software programs which the user can copy onto the system disk. Price is \$199. Reader Service number 460.

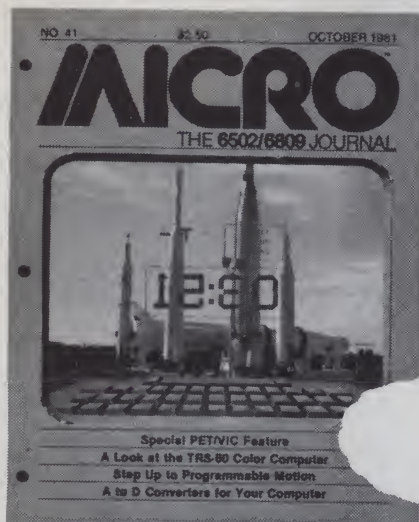
Expanded disk drive storage, including double-sided drives, is available from Interface, Inc., 20932 Cantara St., Canoga Park, CA 91304. The price for an internal single-sided drive is \$470; for an internal double-sided drive, \$570; single-sided external drive costs \$570; and double-sided external drive is \$670. Reader Service number 461.

DG Electronic Developments Co., 700 South Armstrong, Denison, TX 75020, introduced their low-cost expandable Magic RAM that expands the PC in 64K-byte increments. Each 64K block is addressable to any 64K boundary within the available 1M memory space. Prices range from \$399 to \$939. Reader Service number 462.

An IBM expansion board that can handle up to 1M uses only one slot on the computer—leaving four slots free for other peripherals. The TR1M board from Legend Industries, 2220 Scott Lake Road, Pontiac, MI 48054, lets you upgrade your IBM as larger RAMs become available. Reader Service number 463.

We at Microcomputing strive to keep our readers informed about new products for the IBM PC. The material in this column comes from releases provided by manufacturers; due to the large number of releases we receive each month, we can't personally evaluate each product.

A feast of computing ideas.



You'll love every byte.

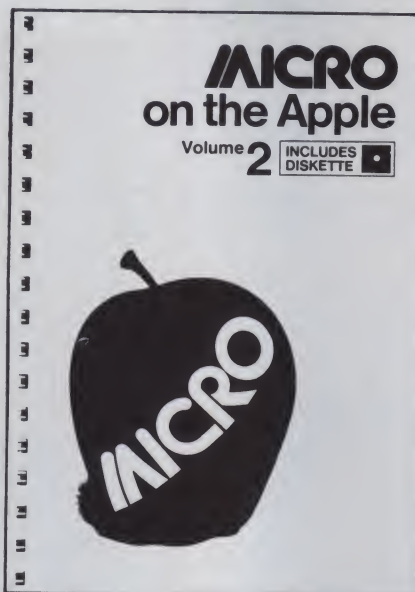
If you work with a 6502 or 6809 based system, you're probably hungry for the facts and ideas that will help you understand the inner workings of your computer. You want to go beyond canned software—use your computer for more than games—learn the advanced programming techniques that enable you to get the most out of your 6502/6809 system.

MICRO, The 6502/6809 Journal, gives you page after page, month after month, of solid information to sink your teeth into. **MICRO** is the premier how-to magazine for serious users of the Apple, PET/CBM, OSI, Atari, AIM, SYM, KIM, and all 6809 based systems including the TRS-80 Color Computer. It's a resource journal internationally respected by professionals in business, industry, and education.

SUBSCRIPTION RATES (U.S. dollars)
Yearly subscription (ISSN 027-9002) saves 20% off the single-issue price.
U.S., \$24 (SPECIAL OFFER: Save 30% off single-issue price: 2 years, \$42)
Other countries, \$27 (via surface mail. Foreign air rates available on request.)

Get more out of your Apple . . .

with the MICRO
ON THE APPLE series



VOLUME 2 just released!

More than 40 new programs on diskette to help you get more from your Apple:

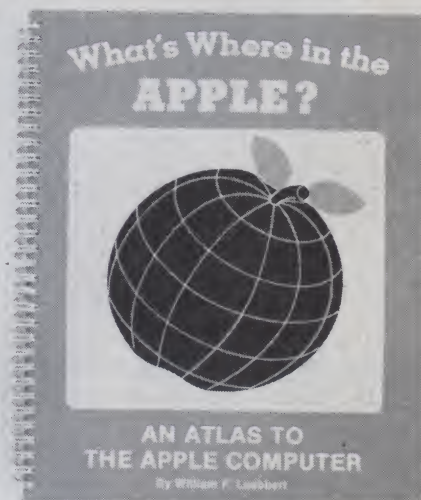
- Machine Language Aids
- I/O Enhancements
- Runtime Utilities
- Graphics and Games
- Hardware and Reference Information

31 choice articles

46 tested programs on diskette
(13 sector DOS 3.2 format)

Volume 1 also available at \$24.95.
Together **MICRO on the Apple 1 & 2** provide more than 70 programs on diskette for less than \$1.00 each. No need to type in hundreds of lines of code.

with the most important book ever published for the Apple



The most comprehensive description of Apple II firmware and hardware ever published—all in one place.

What's Where in the Apple?

- Guides you—with a numerical Atlas and an alphabetical Gazetteer—to over **2,000** memory locations of **PEEKs**, **POKEs** and **CALLs**.

- Gives names and locations of various **Monitor**, **DOS**, **Integer BASIC**, and **Applesoft** routines—and tells you what they're used for.

- Helps BASIC users to speed up their programs.

- Enables assembly language programmers to simplify coding and interfacing.

All Apple users will find this book helpful in understanding their machine, and essential for mastering it!

★ Look for all these **MICRO INK** publications at your local computer store, or

★ Call our **toll-free** number: **1-800-345-8112** (In Pennsylvania, 1-800-662-2444) and charge it to your VISA or MasterCard, or

★ Use the order form below. Send your check (payable to MICRO) and the form to: MICRO, Dept. OA, P.O. Box 6502, Chelmsford, MA 01824.

QTY	ITEM	PRICE EACH	COST
_____	MICRO on the Apple 2	@ \$24.95	_____
_____	MICRO on the Apple 1	@ \$24.95	_____
_____	What's Where in the Apple?	@ \$14.95	_____
_____	MICRO (U.S.) 1 yr @ \$24; 2 yrs @ \$42		_____
_____	MICRO (Foreign) 1 yr @ \$27		_____
	Subtotal		_____
	Massachusetts residents add 5% sales tax		_____
	Add \$2 per book for shipping		_____
	MICRO Journal excluded Allow 4-6 weeks for delivery.		_____
	TOTAL		_____

☐ Check enclosed

☐ Charge my credit card below

Name _____

Company _____

Street _____

City _____

State _____

ZIP _____

Signature _____

☐ VISA ☐ MasterCard

Card Number _____

Expiration Date _____

DEC, Bytewriter Unveil Printers The Traveling Apple Micom Micro Modems Sinclair's Price Breakthrough



The LQP02 letter-quality printer from Digital Equipment Corp.

DEC Printer

The LQP02 letter-quality printer features daisywheel technology, bidirectional printing and audible paper-out warning. It also features shadow bolding—a double-strike with offset function which increases clarity and visibility of characters. The printer has an optional forms tractor and a form-feed switch to automatically advance a page. The LQP02 prints 132 columns at a pitch of 10 cpi, with print speed of 32 cps. The price is \$2600 in DEC-mate Word Processor packaged systems.

Digital Equipment Corp., Maynard, MA 01754. Reader Service number 471.

Letter Quality

A lightweight daisywheel printer/typewriter is now

available for use with popular microcomputers. The Bytewriter is a modified Olivetti Praxis 30 electronic typewriter with built-in Centronics interface; it can also be used as a standard typewriter. It has 44 alphanumeric keys plus 12 function keys, a 12-character buffer and switch-selectable character density. When used as a printer, the Bytewriter types up to 12 characters per second. A self-test program is built in. Price is \$795.

Bytewriter, 125 Northview Road, Ithaca, NY 14850. Reader Service number 468.

Apple Crate

ABCOM Corp., 16005 Sherman Way, Suite 105, Van Nuys, CA 91409, offers a lightweight, waterproof Cordura case for your Apple computer. The Apple Crate's foam lining provides shock and vi-



The Bytewriter printer/typewriter with built-in interface.

bration protection. This compact case fits under airline seats and comes with an adapter to let you connect the computer to your hotel TV. The Apple Crate with an accessory pocket and case for two disk drives costs \$92. Reader Service number 469.

Three High-Speed Modems

Micom's Model 4024 is a Bell 201 and CCITT V.26 compatible 2400 bps modem for use on four-wire point-to-point or multipoint lines. Available in synchronous and



You can take along your Apple computer in an Apple Crate from the ABCOM Corp.



2MHZ 6809 SYSTEMS

GIMIX offers you a variety to choose from!

38 MB WINCHESTER SYSTEM \$17,498.99

HARDWARE FEATURES:

- ★ 2MHz 6809 CPU
- ★ 512KB Static RAM
- ★ 8 RS232C Serial Ports
- ★ 2 Parallel Ports
- ★ DMA Double Density Floppy Disk Controller
- ★ Dual 8" DSDD Floppy Disk System
- ★ Dual Winchester Subsystem with Two 19 MB 5 1/4" Winchester Drives

SOFTWARE FEATURES:

- ★ OS-9 LEVEL TWO Multi-User Operating System
- ★ OS-9 Debugger
- ★ OS-9 Text Editor
- ★ OS-9 Assembler

19 MB WINCHESTER SYSTEM \$8998.09

HARDWARE FEATURES:

- ★ 128K Static Ram
- ★ 2MHz 6809 CPU
- ★ 19 MB 5 1/4" Winchester DMA Subsystem
- ★ 4 RS232C Serial Ports
- ★ 1 MB 5 1/4" Floppy Disk Drive
- ★ DMA Double Density Floppy Disk Controller

SOFTWARE FEATURES:

- ★ OS-9 LEVEL TWO Multi-User Operating System
- ★ OS-9 Text Editor
- ★ OS-9 Debugger
- ★ OS-9 Assembler

128KB MULTI-USER SYSTEM \$6997.39

HARDWARE FEATURES:

- ★ 2MHz 6809 CPU
- ★ DMA Double Density Floppy Disk Controller
- ★ 128KB Static Ram
- ★ 2 RS232C Serial Ports
- ★ Dual 8" DSDD Floppy Disk System

SOFTWARE FEATURES: Your choice of either UniFLEX or OS-9 LEVEL TWO. Both are Unix-like Multi-User/Multi-Tasking Operating Systems.

56KB FLEX / OS-9 "SWITCHING" SYSTEM \$4148.49

HARDWARE FEATURES:

- ★ 2MHz 6809 CPU
- ★ 56K Static Ram
- ★ 2 RS232C Serial Ports
- ★ DMA Double Density Floppy Disk Controller
- ★ 2 Built-in 5 1/4" 40tr DSDD Disk Drives (80 Track DSDD Drive Option .. add \$400.00)

SOFTWARE FEATURES:

- ★ GMXBUG monitor — FLEX Disk Operating System
- ★ OS-9 LEVEL ONE Multi-tasking operating system for up to 56K of memory

WINCHESTER SUBSYSTEMS

Winchester packages are available for upgrading current GIMIX 6809 systems equipped with DMA controllers, at least one floppy disk drive, and running FLEX, OS-9 LEVEL ONE or OS-9 LEVEL TWO. The packages include one or two 19MB (unformatted) Winchester drives, DMA Hard Disk Interface, and the appropriate software drivers. The Interface can handle two 5 1/4" Winchester Drives, providing Automatic Data Error Detection and Correction: up to 22 bit burst error detection and 11 bit burst error correction.

Dual drives can be used together to provide over 30 MBytes of on line storage -- or use one for back-up of the other. (More convenient and reliable than tape backup systems.)

#90 includes one 19MB Drive, Interface, and Software \$4288.90

#91 includes two 19MB Drives, Interface, and Software \$6688.91

Contact GIMIX for systems customized to your needs or for more information.

50 HZ Export Versions Available

GIMIX Inc. reserves the right to change pricing and product specifications at any time without further notice.

1337 WEST 37th PLACE
CHICAGO, ILLINOIS 60609

(312) 927-5510

TWX 910-221-4055

GIMIX inc.

Circle 22 on Reader Service card.

1982 GIMIX Inc.

GIMIX® and GHOST® are registered trademarks of GIMIX Inc.
FLEX and UniFLEX are trademarks of Technical Systems Consultants Inc.
OS-9 is a trademark of Microware Inc.



The Micro4000 modem series is now available from Micom Systems.

asynchronous versions, the new modem also supports fallback operation at 1200 bps. Typical price is \$795.

The Model 4048/V27 can transmit over lines which previously would have been considered impossible for high-speed use. This versatile modem features fallback operation at 2400 bps. Priced, typically, at \$1750.

The Model 4096 is small, fast and intended for point-to-point, full-duplex, four-wire operation. This 9600 bps, CCITT V.29 compatible modem typically sells for \$2695.

These Micro4000 modems for worldwide communications are offered by Micom Systems, Inc., 20151 Nordhoff St., Chatsworth, CA 91311. Reader Service number 473.

Smart Drum Plotter

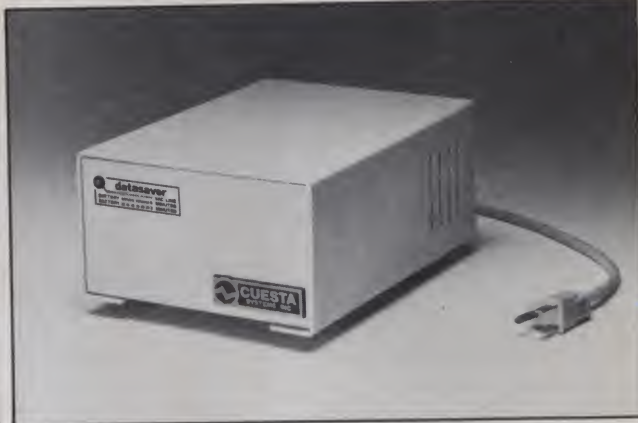
The Professional Drum

Plotter, Model 80Z, incorporates a Z-80 microprocessor programmed to implement ten input commands for designing graphics. A complete ASCII character set is stored in ROM. This drum plotter is available with Centronics, RS-232 or IEEE 488 interface, for use with any microcomputer. The plotter uses standard, sprocket-feed computer or plotting paper in roll or z-fold form, and has a universal pen holder. Price is \$1284.

X and Y Enterprises, PO Box 796, Huntsville, AL 35804. Reader Service number 467.

Battery Backup

The Datasaver is a battery-powered ac backup unit which keeps computer and instrument systems operating during ac power interruptions or transients. It consists of a



The Datasaver from Cuesta Systems, Inc.

rechargeable sealed battery, automatic battery charger, solid-state power inverter, ac line voltage monitor and cut-out switch, front-panel power status indicator and an alarm buzzer to warn the user of the loss of ac power. The 90 W unit can back up the popular microcomputers; the 200 W unit extends protection to larger micros and to network applications. Prices range from \$400 to \$730.

Cuesta Systems, Inc., 3440 Roberto Court, San Luis Obispo, CA 93401. Reader Service number 465.

Lowest Price Yet

The Timex Computer Corp., with headquarters in Middlebury, CT, has announced the first computer priced under \$100. The Ti-

mex Sinclair 1000 is compact, lightweight, fully-assembled, and priced at \$99.95. Timex supports their computer with optional 32-column printer, telephone modem and 16K memory expansion module. Software for business, education and personal use will be available, according to the company.

The Timex Sinclair 1000 is an enhanced version of the Sinclair ZX81; it features an expanded 2K-byte static memory. It uses any black and white television as a monitor, and loads programs from a cassette tape recorder. Reader Service number 445.

TRS-80/PMC-80 Memory Expansion

Imagine an economical



The Model 80Z Professional Drum Plotter from X and Y Enterprises.



The Timex Sinclair 1000 computer, shown with optional 16K memory expansion module.

Printer Supplies

Printer Stands

End the paper mess on your computer desk. Our printer stand allows your paper to be fed from under the printer, making room for the used paper to stack behind the print out of the way. Available with an optional removable shelf (Shown) for easy computer forms change. Available in Large size also, for MX-100 and other large printer users also. Also available with center slot for bottom feed printers. (Large only).

Regular Stand (300010) \$29.95 Large w/shelf (300021) \$49.95
Regular w/shelf (300011) \$44.95 Large w/slot (300050) \$49.95
Large Stand (300020) \$34.95

Ribbon Reloads for MX 70/80/100

Reload your old ribbon cartridge for much less than replacing the cartridge! Quick and easy to do, takes only about 2 minutes each to reload. Includes complete instructions. Available in Black and 4 popular colors!

Black Reload (500000) ... \$3.95 ea. (500001) ... \$3.95 dz.
Red Reload (500010) ... \$4.95 ea. (500011) ... \$4.95 dz.
Blue Reload (500020) ... \$4.95 ea. (500021) ... \$4.95 dz.
Green Reload (500030) ... \$4.95 ea. (500031) ... \$4.95 dz.
Brown Reload (500040) ... \$4.95 ea. (500041) ... \$4.95 dz.

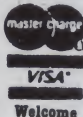
Ribbon Cartridges for MX 70/80

Replacement cartridges for your printer. Complete cartridge for your printer at great savings! Available in Black and 4 popular colors! Buy in 3 packs and save!

Black Cartridge (500050) ... \$10.95 ea. (500051) ... \$29.95/3
Red Cartridge (500060) ... \$11.95 ea. (500061) ... \$31.95/3
Blue Cartridge (500070) ... \$11.95 ea. (500071) ... \$31.95/3
Green Cartridge (500080) ... \$11.95 ea. (500081) ... \$31.95/3
Brown Cartridge (500090) ... \$11.95 ea. (500091) ... \$31.95/3



171 Hawkins Rd.
Centerarch, N.Y. 11720
(516) 981-8868 (voice)
(516) 888-8836 (modem)
Dealer Inquiries Welcome
Prices subject to change



N.Y.S. Residents Add Tax

Add \$8 shipping - handling

UNIVERSAL ENCLOSURE



12" Green Ball Brothers monitor with enclosure measuring 19" x 16.5" x 14". Room inside to mount a Ferguson single board computer or small SS-50, S-100 system. (Power supply available, see below.) Requires +15 volts DC, 1.5 amps, noncomposite (separate sync) input. A sync separator schematic is available. It is also possible to mount a single 8" disk drive or two of the new slim line 8" disk drives in this enclosure. All units are used, and have been 100% tested.

Shipping weight 35# \$65.00

ASCII Keyboard (used) with enclosure to match above monitor. 77 keys, 7 lighted pushbuttons, on/off sw. Requires 5 volts DC. Schematic included. Includes shift, tab, control and cursor control keys. Size: 19" x 4" x 5 1/2".

Shipping weight 8# \$35.00

Modular power supply (missing regulator card) fits inside above monitor enclosure. Includes large transformer that outputs +8.5 volts @ 17 amps, +/-18 volts @ 1.5 amps each, +15 volts @ 1.5 amps (for monitor), three large capacitors (1-18kuf, 2-8kuf), 1-30 amp, 2-3 amp bridge rectifiers. The transformer and rectifiers/capacitors make a perfect unregulated SS-50/S-100 power supply. The schematic for the regulator card is available.

Shipping weight 25# \$25.00



2114-300ns Static Memory				
8/\$12.00	16/\$22.00	20/\$27.00	32/\$41.50	100+ \$1.25 ea.
4116-200ns Dynamic Memory				
8/\$12.00	16/\$22.00	25/\$34.00	32/\$41.50	100+ \$1.25 ea.

D & W ASSOCIATES

PO Box 60, Rome NY 13440

(315) 339-2232 or 337-7968

ALL ITEMS
SENT VIA UPS COD

Please call either number evenings only

**Dealers . . .
SELL**

Selling *Microcomputing* will make money for you. Consider the facts:

Fact #1: Selling *Microcomputing* increases store traffic—our dealers tell us that *Microcomputing* is the hottest-selling computer magazine on the newsstands.

Fact #2: There is a direct correlation between store traffic and sales—increase the number of people coming through your door and you'll increase sales.

Fact #3: Fact #1 + Fact #2 = INCREASED \$ALE\$, which means more money for you. And that's a fact.

For information on selling *Microcomputing*, call 800-343-0728 and speak with Ginnie Boudrieau, our bulk sales manager. Or write to her at *Microcomputing*, 80 Pine St., Peterborough, NH 03458.

MICROCOMPUTING

80 Pine Street Peterborough, NH 03458

800-343-0728

First came MICROPROOF™.

"There is simply no finer program available..."
(Creative Computing, March 1982)

Now:

Electric Webster
SPELLING CHECKER

The Ultimate:

FAST—Can proof ten pages in a minute
EASY—Operates at the stroke of a key
COMPLETE—50,000 word literal dictionary
COMPACT—Fits on 5 1/4" double density disk
VERSATILE—Use with all W P programs
CORRECTS—(Optional, add \$60.00)
AFFORDABLE—\$89.50 (TRS-80*),
\$149.50 (CP M*)

**CORNUCOPIA
SOFTWARE, INC.**

1625 Beverly Place
Berkeley, CA 94707

Circle 197 on Reader Service card.

Contact your local dealer, or order direct — (415) 524-8096

CENTRONICS 779 / RS LINE PRINTER I

MAKE YOUR PRINTER A REAL WORKHORSE WITH OUR NEW PRINTER CONTROLLER BOARD

Remove the controller board in your printer and plug ours in to add the following capabilities:

- Bidirectional printing
- Full UPPER/lower case ASCII *plus* TRS-80 graphics or DSE scientifics character sets in 9 x 7 dot matrix format (9 x 9 available as option — requires print head change)
- Motor control — turns off the motor when the printer is not in use
- 2048 character buffer
- Software selectable features
 - transfer protocol (XON/XOFF or none)
 - character densities (10, 12, 15, 16.5 cpi *plus* double width in each size)
 - self-test
 - forms, length, control

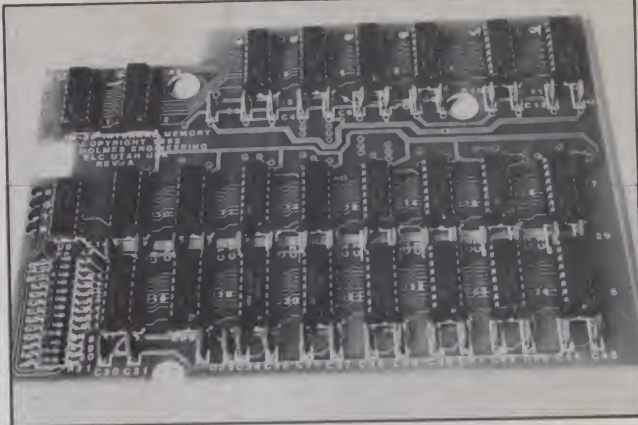
\$350 assembled and tested

Radix Circle 61 on Reader Service card.
Technologies

Suite 400 Carolyn Building
10400 Eaton Place
Fairfax, VA 22030

(703) 385-0900

VISA, MasterCard, check, COD accepted



The Internal Memory from Holmes Engineering upgrades TRS-80 and PMC-80/81 computers.

memory system that expands your memory capacity up to 48K without an expansion interface. The Internal Memory by Holmes Engineering, 3555 S. 3200 West St., Salt Lake City, UT 84119, plugs into the RAM sockets in your system, so you don't use cable connectors. The IM runs reliably at high speeds, avoids reboots and data losses and doesn't overload power supplies. Three models are available: The IM-1 upgrades a TRS-80 Model I with 16K to 32K and costs \$86. The IM-2 for TRS-80 Models I and III has a 48K capacity and costs \$139.50. The IM-2P for the PMC-80/81 also has a 48K memory capacity and costs \$139.50. Reader Service number 480.

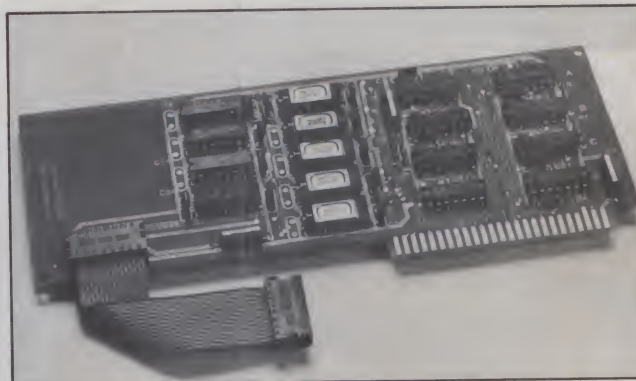
Memory Expansion For Apple II

Davong Systems, Inc., 1061 Terra Bella Ave., Mountain View, CA 94043, announces a

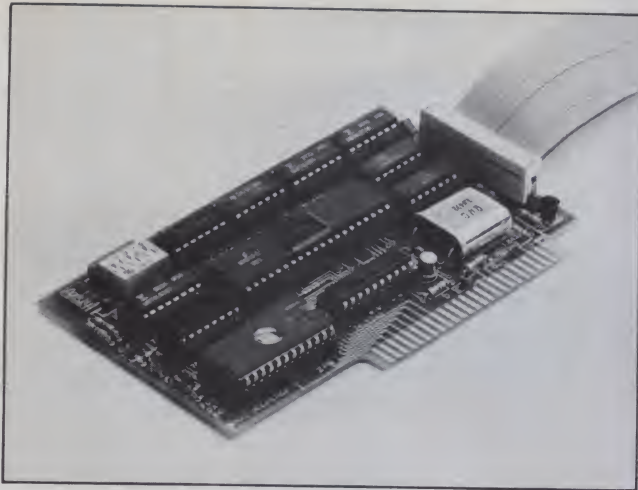
16K RAM expansion card for Apple II computers. The card features extended burn-in for high reliability. The DSI 16K expansion costs \$99. Reader Service number 475.

Ready Reference

System reference cards for Apple microcomputers are offered by Nanos Systems Corp., PO Box 24344, Speedway, IN 46224. These cards are accordion-foldup style, on 80 lb. stock. There are two cards: The Basic-only card is designed for the classroom and for those who do not want to work with 6502 language; it includes 48K memory map with important addresses, Integer and Applesoft statements and functions, derived functions for making better graphics and other information summarized from the Apple manuals; it costs \$3.95. The Basic-and-6502 card also includes instruction length and cycles reference, condi-



Davong Systems, Inc.'s 16K RAM card.



Interplanetary Computer Systems' PDA232C I/O card for Apple.

tion testing information and other 6502-specific references; it costs \$4.95. Reader Service number 466.

Hard Disk for the Apple

A 5M Winchester disk system package for Apple II microcomputers has been introduced by Xebec, 432 Lakeside Drive, Sunnyvale, CA 94086. The package is sold in kit form and requires simple assembly. Included are a single board controller, host adapter card, power supply, cable set, cabinet, software and documentation. Price is \$1299. Reader Service number 464.

Apple Communications Card

The PDA232C card is a versatile serial I/O card for the Apple II computer. On-board firmware provides three oper-

ating modes: I/O mode, terminal mode and remote mode. By interfacing various RS-232C devices such as printers, terminals and modems, this card expands the usefulness of your Apple. Price is \$179, Canadian.

Interplanetary Computer Systems Ltd., 950 Denison St., Unit 17, Markham, Ontario L3R 3K5. Reader Service number 476.

Random Projections

The Model 140-RS Interface drives a random-access slide projector through the RS-232C port of a microcomputer. A new Interface package, designed to convert an asynchronous-serial data stream into signals usable by a Kodak RA-960 or Mast 137-S4 slide projector, is available from Mast Development Company, Davenport, IA 52803. Minimum memory and programming are required for the

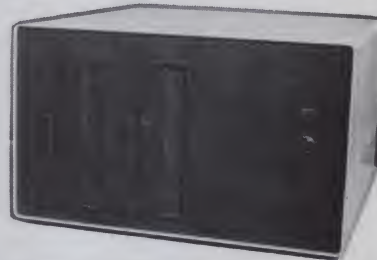


The Xebec hard disk kit for Apple II.

STATES COMPUTERS !

60 N. 300 WEST PROVO UTAH
84601

CALL: (801) 377-2247



Industrial Computer System — \$2695.00

A rugged Z80A system suited for tough applications. Uses *CP/M operating system, allowing use of thousands of CP/M compatible business, industrial and hobby software programs now available. This computer features:

- Z80A Processor!
- 2 Serial Ports!
- 2 8" Double Sided, Double Density Disks, 1 Meg each.!
- 8 Slot - S100 Buss!
- 64K Dynamic RAM!
- EPROM Burner on Board!
- (needs rom kit for operation).
- Just add terminal for working system!

QUME SHUGART ACCESSORY SPECIAL!

New disk drives in boxes.

8" Single Sided	\$465.00
8" Double Sided	575.00
Terminal Cables (RS232) ..	24.95
2716 EPROMS	4.50
4164 Dyn RAMs	10.50
Misc. 8" Floppy Disks	(call)
4116 Dyn RAMs	(call)

ROM kit for industrial computer which allows programming of 2716 EPROMS, kit includes 1 personality ROM, 1 2K X 8 RAM, 1 2K Monitor - \$60.00.

Control Computer Board Bonanza! Special on Z80A full slave S100 board. This is a complete, one board computer to do your slave programs allowing your master computer to run other programs. Slave interrupts master only when something needs attention. Contains Z80A, 2K 2716 EPROM, 2K of static RAM, 25 buffered control lines. Use for control of toasters, coffee pots, sprinklers, stereos, N.C. Mills, nuclear power plants, printers, disk drives, tape drives, or just about anything! Comes programmed to run a SA1000 Hard Disk. Comes with spec. sheet and program examples - \$230.00!!!

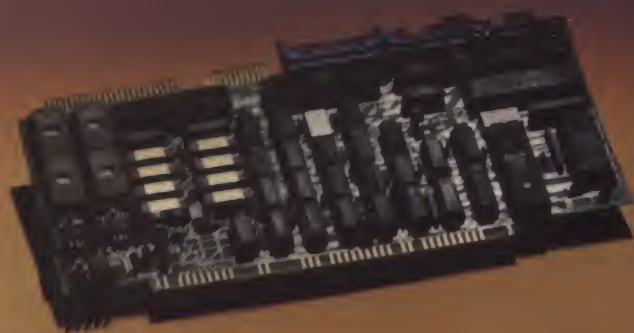
Fast Dot Matrix Printers

175 CPS with factory warranty. 135 column for wide computer paper. These are full sized printers suited for heavy use, not "Hobby" printers!!! Bi-directional operation. Form tractor feed. Condensed print. RS232 hook-up with options - \$995.00!!!



*CP/M Trademark of Digital Research

*A DIVISION OF GOLDEN WEST COMPUTERS INC.



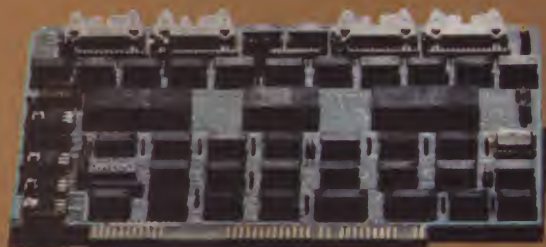
Performance . . .

SBC-100S SLAVE PROCESSOR

- Z80A CPU
- 64K Bank Switchable Memory
- 16K EPROM
- 2 RS-232 Chan. (up to 19.2K BAUD)
- 4 Parallel Ports
- 4 Timers
- IEEE 696 Buss Interface
- Expansion Interface (X-Buss)
- On Board EPROM Burner (Opt.)
- **\$795.00** Single Unit Quantity

SBC-100 MASTER PROCESSOR

- Z80A CPU
- 64K Bank Switchable Memory
- 4K EPROM
- NEC 765 FDC with PLL interfaces to all Shugart compatible Drives
- 2 RS-232 Chan. (up to 19.2K BAUD)
- 2 Parallel Ports
- 4 Timers
- IEEE 696 Buss Interface
- **\$895.00** Single Unit Quantity



SDS-ZSIO/4
ZSIO 4 Port RS-232
Serial Expansion Board
\$295.00 Single Unit Quantity



SDS-HARD DISK INTERFACE
Micropolis 1220 Series
Interface Adapter
\$150.00 Single Unit Quantity
(Includes Software Drivers, Cabling, and Mounting Hardware.)

Software Support . . .

- *CPM 2.2 for Single User Systems
- **TURBODOS Single User or Networking

*Registered Trade Mark of Digital Research Corporation.
**Registered Trade Mark of Software 2000.

. . . And Quality

- Boards Tested on "Bed of Nails"
- Support Logic meets MIL-STD-883 Specifications
- Gold Plated Connectors
- Full One Year Warranty

We have it ALL!



Marketing Division
21162 Lorain Avenue
Fairview Park, Ohio 44126
(216)331-8500
TELEX 980131 WDMR



The Mast 140-RS slide projector interface plugs into any RS-232C computer port.

computer to control all functions of the projector, including on/off and random slide retrieval. Any of 81 slides can be found and projected within 3½ seconds; average search time is 1½ seconds. The system is useful for audio-visual presentations and interactive learning. You can create branching teaching programs using existing slides. Price is \$600.

Mast Development Company, 2212 East 12th St., Davenport, IA 52803. Reader Service number 477.

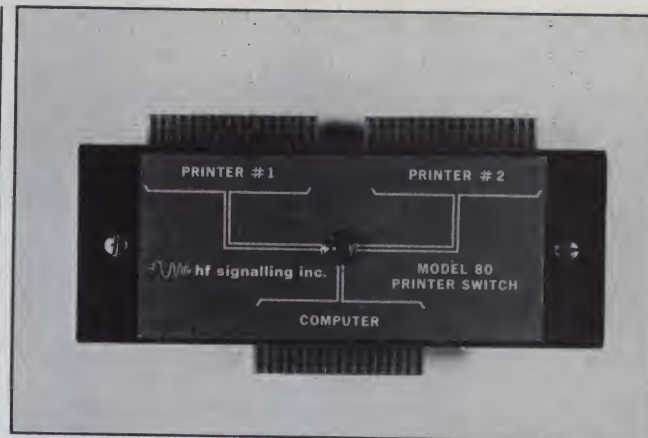
Green Screens

A new line of low-cost, high-resolution green phosphor display monitors has been introduced by USI International, 71 Park Lane, Brisbane, CA 94005. The nine-inch Pi-1 unit has a minimum 64-character by 16-line text display; the 12-inch Pi-2 model has an

80 character by 24-line text display. Both units feature computer-matched styling, brightness control, antireflective screen and LED power indicator. Connection to both is via a standard SO-239 connector or an RCA phone jack. The units come with a cable adapter, allowing simple connection to most micros on the market. The Pi-1 costs \$249 and the Pi-2 costs \$275. Reader Service number 478.

Added Convenience For TRS-80 Systems

HF Signalling, Inc., PO Box 17510, Kansas City, MO 64130, announces their Model 80 line printer switch. Designed for TRS-80 Models I and III, this switch lets you select either of two separate line printers connected to your computer, without changing cables. The Model 80 is a compact module that



The Model 80 line printer switch from HF Signalling, Inc.

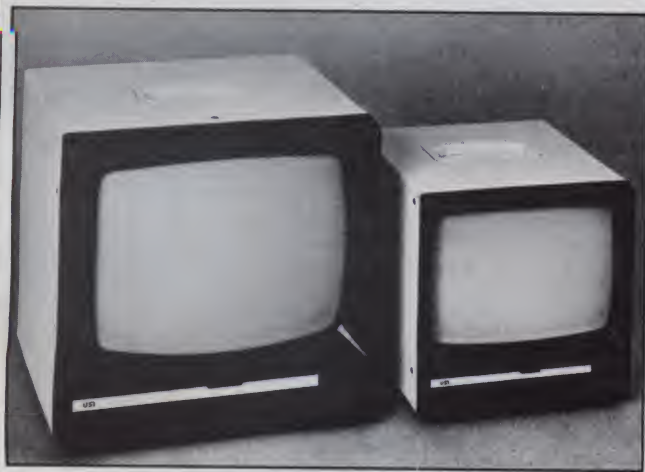
plugs into the printer port of your computer and provides an edge connector for both printers. Price is \$55. Reader Service number 472.

Commodore Graphics

COMAL-80 is now available on a 64K PROM board for PET and Commodore computers. The CBM-COMAL-80 board is simply plugged into the computer to automatically bring

up COMAL-80 graphics capability. The COMAL-80 language has proven itself in educational and business applications; it combines Basic's simplicity with Pascal's powerful programming structures. Basic remains available by typing the command BASIC, so that standard word processing and other software can still be conveniently run.

Instrutek, Christiansholmsgade, DK-8700 Horsens, Denmark. Reader Service number 479.



USI's new monitors feature green phosphor screens.



The CBM-COMAL-80 board installs COMAL-80 graphics in your PET or CBM computer.

Plan Your Route on Your Apple II

A Terminal Emulator for Atari

Osborne 1 Software

Word Processing for CBM Computers

Better Graphics

A new package from Business & Professional Software, Inc. (BPS), 143 Binney St., Cambridge, MA 02142, lets you create business graphics displays on an Apple computer and then print the images with any of more than 20 printers and plotters. The printer/plotter installation kit is called PIK, and it is used to modify BPS's master business graphics package or Apple Business Graphics (marketed by Apple Computer, Inc.) for either the Apple II or the Apple III. The PIK software enables the printer or plotter to produce graphs and charts with the full resolution of the output device. PIK is available from Apple dealers for a \$50-\$75 installation fee or \$150 purchase price. Reader Service number 481.

Spreadsheet Templates

VisiCorp (formerly Personal Software, Inc.), 2895 Zanker Road, San Jose, CA 95134, is now making available finished, generalized financial models for its popular VisiCalc spreadsheet program. VisiCalc Business Forecasting Model can be used for forecasting and analyzing businesses, and can be customized using the VisiCalc program. The model is a series of time-saving, interrelated VisiCalc worksheets which exchange information and together provide most

reports needed. Results of analysis performed within each of the worksheets are transferred to specific locations on other worksheets. Price is \$100. Reader Service number 482.

Hard Disk Backup

Backup is a fast and convenient program that lets hard disk users back up their CP/M 2.x files onto floppy disks. Backup employs a unique scheme to copy files that are larger than the capacity of a disk onto several disks. The package includes a directory display program that provides you with an alphabetically sorted directory listing with file sizes and available space remaining.

Tri-L Data Systems, 900 Fort St., #50, Honolulu, HI 96813. Reader Service number 483.

Routeplanner For Apple II

Columbia Software, 5461 Marsh Hawk Way, PO Box 2235 Columbia, MD 21045, has introduced a software package for people who like to plan ahead. Routeplanner will help anyone who plans business and sales trips, pickup and delivery routes, van pools, transit routes or other trips containing multiple stops. Routeplanner accepts up to 21 route stops whose map coordinates are deter-

mined. After optional route adjustments are made, Routeplanner computes the order of stops and approximate distance for the shortest trip. The package also contains a database program to store map locations of up to 400 accounts, streets, cities and so on. To save time and mileage, Routeplanner may be the answer. Price is \$149, available for the Apple II with 48K, Applesoft and disk drive. Reader Service number 484.

Professional Time Management

Integron Systems, 300 West 109th St., Suite 2J, New York, NY 10025, has released Sundial, a time-management system that maintains appointment lists, generates cross-referenced schedules and analyzes hourly billing for any number of users. Currently available under the Oasis Operating System, Sundial will soon be available under CP/M and Unix. Price is \$400. Reader Service number 485.

Small-Business Billing

The Invoice Writer program, from Information Intelligence, Inc., PO Box 31098, Phoenix, AZ 85046, helps the small-businessperson prepare invoices and bills. It holds about 80 invoices, prints its own forms, permits corrections and additions, provides

for taxes and discounts, and maintains an accounts receivable file. An Apple II with one or two disk drives and a printer are needed. The program is menu-driven and easy to use. Price is \$64.95. Reader Service number 486.

Atari Datacom

A powerful terminal emulator package for Atari 400/800 is now available from the Binary Corp., 3237 Woodward Ave., Berkley, MI 48072. T.H.E. Smart Terminal, an assembly-language program, will run on cassette or disk systems. The program lets Atari users communicate with any of the popular data services, such as The Source, Dow Jones and CompuServe. The user can create files offline for transmission at higher data rates and at more convenient times. T.H.E. Smart Terminal costs \$49.95. Reader Service number 487.

Get Help With the Books

The CPA Partner is an Apple II client writeup package for accounting and bookkeeping firms. It supports integrated client accounting and billing for up to 250 clients and features easy-to-use screens and menus. The package requires 48K RAM and a hard disk. CPA Partner includes a general ledger module with up to 300 accounts, 99 depart-

ments, 1900 double-entry vouchers per month and 15 recurring journal entries for repetitive posting. Budget and comparative reporting is provided, in addition to customized balance sheets, income statements, funds statements and trial balances. Price is \$2000.

Management Information Services, 4966 El Camino Real, Suite 107, Los Altos, CA 94022. Reader Service number 494.

Full-Service Brokerage

The Micro-Broker was designed by stockbrokers, for stockbrokers, to automate their business. The system operates on an Apple II. Micro-Broker provides complete portfolio management and reporting. It interfaces with the Dow Jones News and Quote Retrieval Service to automatically update security prices; the prices are then reflected against portfolio transactions. The broker can maintain a database of business contacts to categorize clients and prospects for instant access and for printing mailing labels. Micro-Broker is priced at \$2000.

Applied Micro Sciences, 16 Pine Hill Road, North Scituate, RI 02857. Reader Service number 488.

Bowling Data System

Rainbow Computing, Inc., 19517 Business Center Drive, Northridge, CA 91324, announces Bowling Data System 2.0, a database program for league secretaries. The system stores and computes data for multiple and/or mixed leagues of up to 40 teams of six bowlers per team. For each team a cumulative record is kept of total pins, games won and lost, total points, high series and so forth. Similar information is maintained for each bowler, as well as high game, handicap and other data. The package requires Apple II Plus and an 80-column printer. Price is \$149.95. Reader Service number 489.

Show and Tell

Executive Briefing System (EBS) is a business and professional graphics package for the Apple II. EBS creates bootable disk slide shows which will run automatically or can be controlled from hand controllers or the keyboard. Viewing time, multidisk wrap-around and special effects such as curtains, dissolves, spirals and cuts can be pre-programmed or specified mid-show. The user can add text or line drawings to high-resolution images created by Visi-Plot or other graphics packages. Price is \$199.

Lotus Development Corp., 180 Franklin St., Cambridge, MA 02139. Reader Service number 490.

Real Estate Templates

The Quikcalc Real Estate Investor, from Simple Soft, Inc., 480 Eagle Drive, Suite 101, Elk Grove, IL 60007, helps the user evaluate potential real estate sales or purchases. Separate models are provided for individual residences and for income properties. This template model for 64K micros using either VisiCalc or SuperCalc is currently available for Apple II 3.3 DOS, IBM PC and Osborne 1 computers. Price is \$129.95. Reader Service number 499.

Play the Market

Now you can lose your shirt on Wall Street and walk away smiling. Computer Stocks & Bonds, a new game from Avalon Hill, offers a no-risk investment experience to owners of Apple, Atari, TRS-80 and PET computers. With an initial \$5000 stake, you and your friends can speculate in shares of nine different corporations, or salt some of your money away in safe municipal bonds. Will you opt for slow but steady capital appreciation and the secure dividends of a public utility or mutual fund, or go for more spectacular growth in the glamour industries? Invest \$20 (in real money) and try your luck.

The Avalon Hill Game Com-

Circle 68 on Reader Service card.

Micro Resources Corporation introduces:

MR EDit



The Intelligent workhorse of CP/M and MP/M compatible video text editors

- Written by experienced professionals
- An extremely powerful and versatile tool for the professional software developer and the serious hobbyist
- All of the advanced video editing functions that you would expect (and some that you wouldn't)
- Allows you to custom configure the keys on your terminal to match your needs
- Complete with extensive documentation

MR EDit is the necessary addition to your stable of thoroughbred software. Where power and versatility are important to your efforts, MR EDit outperforms other hayburners costing 50% to 70% more.

SPECIAL PRICE—only \$90.00.

Manual is available separately for \$15.00 which is refundable with purchase of software. (Tenn. residents add 6.75% sales tax)

Visa and Mastercard welcome: Send account number and expiration date.

Order today by letting us know your CRT type and the disk format desired.

(8" single density CP/M or 5 1/4" soft sectored formats)

Micro Resources Corporation

6922 Harding Road Suite 117-G
Nashville, Tennessee 37221

Dealer inquiries welcome.

CP/M and MP/M are registered trademarks of Digital Research, Inc.

Circle 202 on Reader Service card.

EXTENDED Z-FORTH IN ROM by Tom Zimmer 5 to 10 times faster than Basic. Once you use it, you'll never go back to BASIC! A FULL 8K OPERATING SYSTEM source listing add	\$100.00 \$ 20.00
OSI FIG-FORTH True fig. FORTH model for OS65D with fig editor named files, string package & much more	\$ 45.00
STARTING FORTH by L. Brodie The best reference for FORTH available to date. A must for the beginner, and refreshing to the experienced FORTH Programmer. paperback only.	\$15.95
TINY PASCAL Operates in fig-FORTH, an exceptional value when purchased with forth. Requires 32K min.	
TINY PASCAL & documentation	\$ 45.00
FORTH & TINY PASCAL	\$ 65.00
16 K RAM BOARD with 2K of EPROM The first and only memory board for 16 K of Ram plus 2 K of 2716 EPROM. Available as a bare board for the C1P only.	\$39.95
PROGRAMMABLE CHARACTER GENERATOR Use OSI's graphics or make a complete set of your own! Easy to use, Bare Board Only.	\$ 39.95
PROGRAMMABLE SOUND BOARD Complete sound system featuring the AY-3-8910 sound chip. Bare boards only.	\$ 29.95
32/64 CHARACTER VIDEO MODIFICATION Oldest and most popular video mod. True 32 chr. C1P, or 32/64 chr. C4P video display. Optional Multiplexer board allows all three OSI Screens. Bare Board only.	\$ 39.95 \$ 14.95
ROMS!!! Augment Video Mod with our Roms. Full screen editing, print at, selectable scroll, disc support and many more features.	
Basic 4 & Monitor	\$ 44.95
Basic 3	\$ 15.95
All 3 for	\$ 59.95
65D DISASSEMBLY MANUAL by Software Consultants First class throughout. A must for any 65D user.	\$ 25.95
NUMEROUS BASIC PROGRAMS, UTILITY PROGRAMS AND GAMES ALONG WITH HARDWARE PROJECTS. ALL PRICES ARE U.S. FUNDS. Send for our \$1.50 catalogue with free program (hardcopy) and Auto Load Routine.	

OSI



Progressive Computing
Rick Lotoczky
3486 Countryside Circle
Pontiac Twp., MI 48057
(313) 373-0468

Joe Endre
3336 Avondale Court
Windsor, Ontario, Canada N9E 1X6
(519) 969-2500 (call after 4 PM)

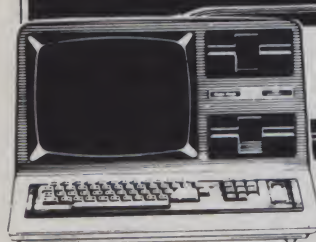
OSI



Canadian Residents:
Price list in Canadian available on request.

progressive computing

DISCOUNT



TRS-80®

TRS-80 MODEL III

\$2049 \$819

48-K 26-1066 16-K 26-1062

TRS-80 MODEL II

\$3279

64-K 26-4002

TRS-80 8.4 MEGABYTE HARD DISKS (PRIMARY UNIT) ... \$4000.

TRS-80 MODEL 16

\$4925

128-K 26-6002

TRS-80 COLOR	\$309	\$455	\$525
4-K	1001	16-K 26-3002	32-K 26-3003

WE HAVE COLOR DISK DRIVES 0 — **\$475** 1-2-3 — **\$315**

WE ALSO CARRY EPSON AND OKIDATA PRINTERS,
XEROX 820 AND ALTOS COMPUTERS.
NO OUT-OF-STATE TAXES. T.M. TANDY CORP.

Sold with the manufacturer's limited warranty. Copies of such warranty may be obtained for review from Perry Oil and Gas Co.

PERRY OIL & GAS INC.

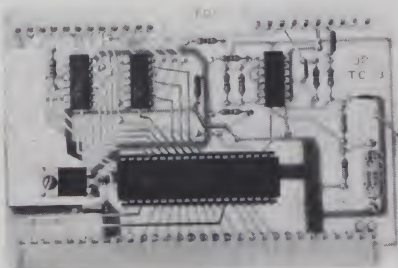
Dept. No. M-13 137 NORTH MAIN ST., PERRY, MICHIGAN 48872

DEALERS' INQUIRIES INVITED
WE ACCEPT CERTIFIED CHECKS,
CASHIERS CHECKS
AND MONEY ORDERS.

PHONE (517) 625-4161. MICH
FOR OUR PRICES,
PLEASE CALL TOLL FREE
1-800-248-3823

JPC PRODUCTS FOR

6800 COMPUTERS



High Performance Cassette Interface

- **FAST** - 4800 Baud Loads 4K in 8 Seconds!
- **RELIABLE** - Error Rate Less Than 1 in 10⁶ Bytes.
- **CONVENIENT** - Plugs Directly Into The **SWTPC**.
- **PLUS** - A Fully Buffered 8 Bit Output Port Provided.
- **LOW COST** - \$59.95 For Complete Kit.
- **OPTIONAL** - CFM/3 File Manager.

Manual & Listing \$19.95
(For Cassette Add) \$ 6.95

TERMS CASH, MC or VISA.

Shipping & Handling \$3.00

**JPC PRODUCTS CO.**

Phone (505) 294-4623 Circle 92 on Reader Service card.
12021 Paisano Ct.
Albuquerque, N.M. 87112

pany, 4517 Harford Road,
Baltimore, MD 21214. Reader
Service number 496.

Applesoft Utility

Amper-Magic for the Apple II gives Basic programmers the ability to add machine-language routines to Applesoft programs without the need to know any machine-language. This menu-driven utility uses the ampersand function to access machine-language routines by name. Your Basic program can then pass variables back and forth to the routines exactly as you would do in Basic; no pokes or peeks required. Amper-Magic with 23 machine-language routines is priced at \$75.

Anthro-Digital, Inc., 103 Bartlett Ave., Pittsfield, MA 01201. Reader Service number 495.

Software for The Osborne

Eleven software products for the Osborne 1 computer, including graphics games, 50,000-word spelling proof-reader and programming languages, are available from The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423. The MYCHESS championship level chess program features a full graphics board display. Also offered are the original Adventure game, the Eliza "therapist" and arcade-style video games. Programming languages include C, RATTOR, Lisp and macro assemblers for Z-80 and 8080 op codes. Programs are priced from \$19.95 to \$49.95. Reader Service number 497.

Apple Nutrition

The Eat Smart nutrition program, written for the Apple II, analyzes what you've eaten during the day and tells you how to shape up your diet. The program analyzes up to 136 foods in terms of their percentage of the Recommended Dietary Allow-

ances of eight key nutrients; the RDA is based on age and sex. Calories and total milligrams of sodium and cholesterol are also given. The \$19.75 price includes a nutrition educator's guide and other materials. Available by direct mail only.

Eat Smart Kit, The Pillsbury Company, 3286 Pillsbury Center, Minneapolis, MN 55402. Reader Service number 492.

CBM Word Processing

Two new word processing packages are offered by Professional Software, Inc., 51 Fremont St., Needham, MA 02194. WordPro 2 Plus runs on any Commodore computer with a minimum of 16K memory, and is supplied on both cassette and disk for \$199.95. WordPro 5 Plus is for the Commodore 8032 with 64K expansion board. WordPro 5 Plus supports multiuser systems and many business-oriented programs; it costs \$450. Reader Service number 493.

Educational Networking

The Classroom Monitor is an educational/training software package that brings the advantages of local area networks to the classroom. The software creates a teacher's workstation to control and monitor a classroom of 64 Apples on an Omninet network. The teacher's workstation acts as a shared peripheral controller, providing the network with disk-sharing and printer-sharing capabilities. The teacher can set up a programming demonstration on one student Apple and let other student Apples monitor that screen. He can look at any student's display on the teacher's monitor, and he can download every student station from a single disk located on the teacher's disk drive. Price of Classroom Monitor is \$375.

Software Connections, Inc., 1800 Wyatt Drive, Suite 17, Santa Clara, CA 95054. Reader Service number 498.

TE
M.C.
sche
C.O.
Shi

> ES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES

SK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES DISK DRIVES

BRAINS-MAINFRAMES

SUPERBRAINS



SUPERBRAIN QD 64K

List \$2995.....only \$2449

ZENITH



Z-89 48K

List \$2895.....only \$2099

Z-90 64K DD 3195

ONLY \$2489

COMPUSTARS

Available to Dealers

NORTH STAR

Minicomputer
Performance

Green Phosphor

Options:

Graphics + CP/M

List

Only

ADVANTAGE



ZENITH

Monitor Green Phosphor \$114

TERMINALS Z-19

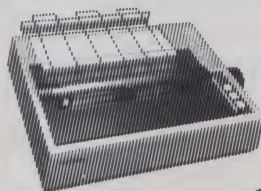
INTERUBE III Super Smart\$638

EPSON

MX-80 FT.\$598

MX-80\$474

MX-100\$749



ANADEx 9501.....\$1290

NEC Letter Qual Friction & Tractor.....call

ZENITH printer Z-25 list 1595 only.....\$1256

C. Itoh F10 Letter quality\$1449



ATARI 400
800

List \$399.....only \$340

List \$899.....only \$675

Wonderful Games—Education for your family

Main Frames-S-100.....\$200 up

Advanced Micro Digital Superquad Single Board Computer

with Z80 64K and FDC.....\$749

Dual 68000 CPU S100-Super Fast—Save.....CALL

AMERICAN SQUARE COMPUTERS is organizing a World Wide Association of Computer Dealers. Open a Store or Start Work Out of Your Home! We Charge NO FRANCHISE FEE! (Our Competitors charge a FRANCHISE FEE of from \$15,000.00 to \$45,000.00.) Be a Winner! Let US help YOU get started MAKING MONEY by HELPING PEOPLE to put COMPUTERS to WORK. Write or Phone today.

TELEVIDEO TERMINALS...910 \$518,...925 \$718

GODBOUT COMPUPRO

Super Sixteen 8085/8088 is the fastest combo 8/16

CPU. LIST\$3904Special \$2873

.....

SEATTLE'S

16 bit COMPUTER is here! 8 MHz 8086 CPU the fastest

S-100 computer! 128K Static RAM, DD Disk Controller,

22-slot Main Frame, 86-DOS, #2 128K

LIST\$4185 ONLY \$3349

#1 As above but 64K LIST ... \$3190 ... ONLY 2649

.....

CALIFORNIA COMPUTER 2210A

LIST \$1995.....ONLY \$1722

Z80, 64K, I/O, Disk controller + CP/M.

Model 302 is the larger system: 2.4 Mb 8" Z80, 64K,

and optional OASIS, CP/M, or MP/M operating system.

LIST.....\$5295.....ONLY \$4674

.....

SYSTEMS GROUP SYSTEM 2800

Runs CP/M or OASIS. Supports single user & multi-

user & multi task. Up to 5 megabytes with 8" drives.

Optional 10-megabyte hard disk.Optional tape back

up #2812 \$5035.....ONLY \$3775

.....

TARBELL'S

Empire I&II have two 8" disk drives. The I is single

sided, the II is double sided.

FREE Business Software

Empire I LIST \$4888 Only \$3666

We sell The Finest Hardware

AMERICAN

919-889-4577

4167 Kivett Dr.



We sell The Finest Software

COMPUTERS

Jamestown, NC 27282

919-883-1105

CP/M is a registered trademark of Digital Research, Inc.

Circle 56 on Reader Service card

LOWEST PRICE · BEST QUALITY

NORTH STAR Horizon 2



2-5¼" Disk Drives
64K Double Density
Factory assem. & tested
Factory guaranteed

A few left
Low Price only

\$2499

**Powerful North Star BASIC Free
Superb for Business & Science**

HORIZON STANDARD IS NOW HRZ-2-64K QUAD

Factory Assembled & Tested	List	Only
Horizon-2-64K-Quad	\$3599	\$2689
Horizon-1-64K-QHD 5	\$5999	\$4559
Horizon RAM ASM. 32K = \$424 64K = \$594		
Big Sale on Multi-User Time-Sharing		call
English to Basic Translator		\$99
North Star Hard Disk 18 Mb	\$5375	\$4568
North Star Time Sharing Multi User		call
Zbasic 2 to 5 times faster!	\$350	call
Secretary Word Processor		\$99
Wordstar Word Processor		\$296
Floating Point Board	\$399	\$339
Oasis Multi-User Software	SAVE	call
CP/M for N* Extra features		\$230
Micro Mike Software	SAVE	call
Ecosoft Accounting MICROSTAT		\$265
Pascal-80	\$600	\$515
Extra Precision Basic		\$50
Northwood	\$199	\$179
Mailmanager	\$299	\$224
Infomanager	\$399	\$349
General Ledger	\$499	\$429
Accounts Receivable	\$499	\$429
Accounts Payable	\$499	\$429
Inventory	\$499	\$429
Order Entry	\$499	\$429
PROPAC	\$1499	\$1274
DOS + Basic 5.2		27

DECISION I



"The IBM-360 on the Z-80 & S-100 BUS!"

Sixteen Programs running simultaneously! Free CPM, Microsoft BASIC and WORDSTAR with Complete system!

	LIST	ONLY
DECISION 1 + 65K Static + 8" Disks	\$4375	3377
DECISION 1 + 65K Static + 2 - " Disks	4195	3149
DECISION 1 + 65K Static + 5" Disk + 5MB Hard Disk	5990	4784
DECISION 1 3 user 195K Static + 5" Disk + 5MB Hard Disk + MICRONIX	8035	6428
DECISION 1—Z-80 + 1/0 = Power	1725	1294

MORROW 8" Disk

Discus 2D + CP/M 600K only \$834
Discus 2 + 2 + CP/M 1.2 MEGA B \$1074
Add Drives 2D = \$599 2 + 2 = \$795
Discus 2D-dual + CP/M Only \$1384
Free Microsoft BASIC from MORROW with Discus system or hard disk



M-26 MORROW Hard Disk
26,000,000 Bytes!!
List \$4495 Only \$3394 || Free CPM + BASIC | |
M-20 List \$4795	Only \$3835
M-10 List \$3695	Only \$2955
M-5 List \$2495	Only \$1994

InterSystems

Z-80A CPU 4 MHz
64K Dynamic RAM
Front Panel

VI/O-1 - with interrupts
FDCII Disk Controller
20 slot motherboard

List \$3795 **Only \$2839**

Without front panel as above only \$2716
Front Paneless Recommended for Business

Save on Memory and Programs

Systems Memory 64K A&T \$459
Systems Memory 64K Bank \$555
Microangelo \$985

Corvus Hard Disk SAVE
SSM Video BRD VB3 kit \$361
Spectrum Color ASM \$326

Cat Novation Modem \$169
Memory Merchant 16K \$159

Which Computers are Best?—FREE.
Insured Shipping at Low Rates. Call
For Latest Prices, Details. We Beat
Advertised Prices.

Factory Guarantees

Expert Advice

AMERICAN



COMPUTERS

919-889-4577

4167 Kivett Dr.

Jamestown N.C. 27282

919-883-1105

Circle 56 on Reader Service card.

©CP/M is a registered trademark of Digital Research, Inc.

ELCOMP

BOOKS and
SOFTWARE

For ATARI - PET - OSI - APPLE II - 6502

ATARI BASIC - Learning by Using

This new book is an "Action" Book. You do more than read it. Learn the intricacy of ATARI-BASIC through the short programs which are provided. The suggestions challenge you to change and write program routines. Yes, it's exciting. Many of the programs are appropriate for beginners as well as experienced computer users. (Screen Drawings, Special Sounds, Keys, Paddles, Joysticks, Specialized Screen Routines, Graphics and Sound, Peeks and Pokes and special stuff!).

Order-No. 164 \$9.95

Games for the ATARI-Computer
How to program your own games on the ATARI. Complete listings in BASIC and Machine Language of exciting games. Tricks and hints.

Order-No. 162 \$4.95

ATMONA-1

Machine Language Monitor for the ATARI 400/800.

This powerful monitor provides you with the firmware support that you need to get the most out of your powerful system. ATMONA-1 comes on a bootable cassette. No cartridges required. Disassemble, Memory Dump HEX + ASCII (Change Memory Locations, Blocktransfer, fill memory block, save and load machine language programs, start mach. Lang Progr (Printer optional).

Comes with Introductory article on how to program the ATARI computer in machine language. (Available also in ROM)

Order-No. 7022 \$19.95

ATMONA-2 Superstepper

A very powerful Tracer to explore the ATARI ROM/RAM area. Stop at previously selected address. Opcode or operand (cassette).

Order-No. 7049 \$49.95

EDITOR/ASSEMBLER for ATARI 800, 32K RAM

Extremely fast and powerful Editor/Assembler. (8K Source code in about 5 seconds) Includes ATMONA-1.

Order-No. 7098 \$49.95

MACRO-Assembler for ATARI 800, 48K RAM

Please specify your system: RAM, disc or cassette.

Order-No. 7099 \$69.00

Gunfight - For ATARI 400/800 16K RAM, needs two joysticks, animation and sound. (8K machine language).

Order-No. 7207 \$19.95

EPROM BURNER for ATARI 400/800. Bare boards only with description, schematic + software (2716, 2732).

Order-No. 7041 \$99.00

Invoice Writing for very small business with ATARI 400/800 16K RAM.

Order-No. 7022, cas. \$29.95

Order-No. 7200, disc. \$39.95

Wordprocessor for ATARI 800, 48K RAM

Order-No. 7210 \$29.95

How to connect your EPSON-Printer to the ATARI 400/800. Construction article with printed circuit board and software. (Screenprint and variable characters per line).

Order-No. 7210 \$19.95

OSI OSI OSI OSI OSI

The First Book of Ohio Scientific
Introduction to OSI computers. Diagrams, hardware and software information not previously available in one compact source. 102 pages.

Order-No. 157 \$7.95

The Second Book of Ohio Scientific

Very valuable information about OSI microcomputer systems. Introduction to OS-65 D and OS-65U networking. Hardware and software hints and tips. Systems specifications. Business applications.

Order-No. 158 \$7.95

ELCOMP Publishing, Inc., 53 Redrock Lane

Pomona, CA 91766, Phone: (714) 623-8314

Payment: Check, Money Order, VISA, Mastercard, Eurocheck. POSTPAID or PREPAID in USA. \$5.00 handling fee for C.O.D. All orders outside USA: Add 15 % shipping. CA add 6.5 % sales tax. ATARI is a registered trademark of ATARI Inc. APPLE II is a registered trademark of APPLE Inc.

ELCOMP

BOOKS and
SOFTWARE

Circle 169 on Reader Service card.

REVIEWS

(from page 162)

the root of the word to the dictionary.

There are two other ways to use Spell. In the Lookup mode, unrecognized words are listed to the screen. You have no opportunity to make corrections or additions to the dictionary. You might want to use this method when you have many names of persons or places on the list and don't want to take the time to go through them individually.

However, if there are more items than your screen has lines, these words will move by faster than you can read them. You will still have to go back through the text for misspellings. The other alternative is to have the misspelled words placed in a file for later reference.

Spell will run on Heath computers as well as CP/M systems. It will process files produced by most text editors and words processors.

The documentation is compact, well written and very complete. To use the program, you simply type SPELL followed by the name of your file.

A series of switches is provided so that you can easily create new dictionaries of special terms or new tables of prefixes

and suffixes, change the marker character, alter the designation of the backup file created when you run Spell or change the character assumed to denote a text formatting command. The theory of the hash coding technique used to create the program is described and information given on patching the program with a list of patch locations.

The program is not infallible. I save a lot of time catching typos and subtle misspellings with Spell. Claimed lookup speed is 4000 words per minute on a 4 MHz machine. One of my files containing 8041 words (Spell tells you the word count of your document) was processed in just over two minutes, almost exactly on target.

Spell is a real workhorse. For the price, ease of operation, speed and minimal disk file requirements, you can't afford to be without it.

(The Software Toolworks, 14478 Glorietta Drive, Sherman Oaks, CA 91423. \$49.95.)

Charles Perelman
Beverly Hills, CA

Apple-Aids

A first-aid kit
Offers a solution
For Apple disk problems

Accidents will happen—even among computers, so accurate and so reliable. And they'll happen especially when you're using your disk drives.

You may, for example, forget the starting location or length of a machine-language program. You may make a mistake in an EXEC file, and need to edit it. Or you may accidentally delete a disk file you had wanted to keep.

Well, Apple owners, be of good cheer: a first-aid kit called Apple-Aids is here to help. Apple-Aids is a series of 12 utilities for the Apple II; these utilities take care of a number of Apple II disk problems (including one or two you might not know you had!).

For example, Apple-Aids can increase a disk's storage capacity by 6K to 8K, depending on whether you use DOS 3.2 or 3.3. It does this by erasing part of the DOS image normally placed on each disk by the Apple DOS; the disk loses the ability to boot the system, but in all other respects it behaves normally.

Apple-Aids can also show you graphically just how much of the storage space on your disk is being used, and it can give you two different kinds of file directories.

One directory lists each file, and shows which sectors that file occupies. This directory can be a prelude to examining and possibly editing the files on a disk sector by sector—and Apple-Aids can examine and edit files sector by sector.

Happy Hands

Offers Discounts on All

TRS-80TM COMPUTERS

We Have What You Are Looking For

* Free Shipping Within United States

* 26-1006 Mod III 48K \$2,055.00

* 26-3001 4K Color 310.00

* 26-3002 16K Color 455.00

* 26-3003 32 K Color 520.00

* No Tax On Out of State Shipments

For Additional Prices and

Shipping Information

Call Toll Free

1-800-545-9019

N.M. Residents Call 257-7865

or write

HAPPY HANDS

P.O. DRAWER I

RUIDOSO, NEW MEXICO

88345

Circle 243 on Reader Service card.

Super Specials on **SUPERBRAIN II**S

SUPERBRAIN® DD, \$1994

Through July 7, 1982 **QD, \$2369**

NEW DOUBLE SIDED 80 TRACK SD, \$2799

INTERTEC has introduced a new model, the SD (super density) with dual double sided 80 track drives—**TWICE THE CAPACITY OF THE QD**—. The SD SUPERBRAIN is available from Mini MicroMart for \$2799

SUPERBRAINS come with CP/M; with the addition of an appropriate printer, and the necessary software you can have a complete data processing and/or word processing system.

NOW FREE MicroSoft Basic 80

You can take advantage of our MicroPro word processing software special. WordStar for only \$269; We will include MailMerge with WordStar for \$358 or for only \$489 you get the full package— WordStar, MailMarge and SpellStar

MiniMicroMart stocks the full INTERTEC line.

Basic 80 is FREE, and a complete accounting package—GL, A/R, A/P, and payroll are available to run in MICROSOFT BASIC for only \$269

You can add capacity to your SUPERBRAIN by adding their 10 megabyte DSS Hard Disk. We offer it for only \$2995. We include the adapter cable to the SUPERBRAIN (if requested) at no extra charge.

If you need a distributed processing system, INTERTEC has lowered prices on their full series of COMPUSTARS— the VPU 10, the VPU 20 the VPU 30 and the VPU 40. Virtually any number of these can be daisy- chained to share one of their hard disks, or they can be utilized as a stand alone computer, just like a SUPERBRAIN.

—CALL US FOR PRICING—

SUPERBRAINS and COMPUSTARS come with two built in serial ports, so you can support two printers or a printer and a modem. Among the printers suitable for the SUPERBRAIN are: Centronics 730-3, the 739-3, the 704-9 the TI 810s or 820s, or Okidata 82s, 83s or 84s (serial version) the IDS PRISM series is also suitable. If you choose to use an Epson, you will also have to buy one of their serial interface boards. If you want a letter quality printer there is the NEC 3510 or 7710, the Diablo 630 or the Qume Sprint 9/45.

All prices, F.O.B. shipping point, subject to change. All offers subject to withdrawal without notice. Advertised prices reflect a 2% cash discount (order prepaid prior to shipment). C.O.D.'s and credits cards are 2% higher.

MiniMicroMart, Inc.

943 W. Genesee St. BOX 2992K Syracuse, N.Y. 13204 (315) 422-4467 TWX—710-542-0431

Circle 238 on Reader Service card.

Microcomputing, July 1982 157

ANNOUNCING FORTHWRITE

AN OUTSTANDING WORD PROCESSOR FOR YOUR TRS-80 MODEL I OR III OR IBM PERSONAL COMPUTER!

If you need to type any of the following sorts of documents: business or personal letters, form letters, proposals and estimates, term papers and theses, newspaper and magazine articles, books, stage scripts — then FORTHWRITE is the tool you want. Designed for easy and effective use by computer novices, unusual power and flexibility for the advanced user's most complex tasks, all with instant response time.

FORTHWRITE combines the power of MMSFORTH with the best features of SCRIPSI (trademark of Tandy Corp.) and WORDSTAR (trademark of MicroPro). Learning becomes easy thanks to on-line Help screens, excellent keyboard mnemonics and screen prompts, a good manual and sample documents. "Include" feature permits internal chaining of documents, text blocks (and address files), custom keyboard entries, etc. Outdenting, multiple-line odd and even headers and footers, screen windowing to 255 columns, MORE.

Standard serial and parallel printer drivers with in-line printer control codes are provided, plus TRUE PROPORTIONAL drivers with tabbing for the NEC Spinwriter and TRS-80 Daisy Wheel II printers, subscript, superscript and boldprint on the above and Epson/IBM printers, a printer spooler and MUCH more. Print capacity is limited only by disk space (multiple documents can be chained at printout and up to 8 disk drives can provide contiguous data space), while editing takes advantage of the exceptional speed of in-memory operation. A print-to-disk option permits examination of formatted output without hardcopy.

FORTHWRITE V1.0 (requires MMSFORTH V2.0/2.1, 2 drives & 48 K RAM) **\$175.00***

mmsFORTH

THE PROFESSIONAL FORTH SYSTEM FOR TRS-80 AND IBM PC

(Thousands of systems in use)

MMSFORTH Disk System V2.0 (requires 1 drive, 32 K RAM):
For Radio Shack TRS-80 Model I or III..... **\$129.95***
For IBM Personal Computer (80-col. screen)..... **\$249.95***

AND MMS GIVES IT PROFESSIONAL SUPPORT

Source code provided
MMSFORTH Newsletter
Many demo programs aboard
MMSFORTH User Groups
Inexpensive upgrades to latest version
Programming staff can provide advice, modifications and custom programs, to fit YOUR needs.

OTHER MMSFORTH PRODUCTS:

The DATAHANDLER database management sys..... **\$59.95***
FORTHCOM communications program..... **\$39.95***
MMSFORTH UTILITIES Diskette..... **\$39.95***
MMSFORTH GAMES Diskette..... **\$39.95***
MMSFORTH GENERAL LEDGER..... **\$350.00***
TRADESHOW Commodities Exchange
smart terminal..... **\$995.00***

FORTH BOOKS AVAILABLE

MMSFORTH USERS MANUAL - without Appendices, for non-owners..... **\$17.50***
STARTING FORTH - best companion to our manual..... **\$15.95***
THREADED INTERPRETIVE LANGUAGES - advanced, excellent analysis of MMSFORTH-like language..... **\$18.95***
PROGRAM DESIGN & CONSTRUCTION - Intro. to structured programming, good for Forth..... **\$13.95***
FORTH -79 STANDARD MANUAL - official reference to 79-STANDARD word set, etc..... **\$13.95***
FORTH SPECIAL ISSUE, BYTE Magazine (Aug. 1980) - we stock this collector's item for Forth users and beginners..... **\$4.00***

* - ORDERING INFORMATION: Software prices include manuals and require signing of a non-transferable single system, single-user license. Describe your Hardware. Add \$2.00 S/H plus \$3.00 per MMSFORTH and \$1.00 per additional book; Mass. orders add 5% tax. Foreign orders add 20% UPS COD, VISA & M/C accepted; no unpaid purchase orders, please.

Send SASE for free MMSFORTH information
Good dealers sought.

Get MMSFORTH products from your
computer dealer or

MILLER MICROCOMPUTER SERVICES (K7)

61 Lake Shore Road, Natick, MA 01760
(617) 653-6136

The other directory lists the name of each file, including deleted files. It tells what kind of file it is, and for machine-language files gives the starting address and the length; and it tells whether the file is locked or unlocked.

If you're unfamiliar with what happens when the Apple II deletes a file, it may surprise you that Apple-Aids can list deleted files. Actually, the delete command does not erase a file; it merely "deactivates" the file so that you no longer have access to it. But until you write over the old file with a new one, the deleted file is still physically present on the disk.

Thus, Apple-Aids can list files that have been deleted. Moreover, it can restore deleted files—unless those deleted files have been written over by new ones.

Apple-Aids can also copy disks, including "uncopyable" disks, provided they use the standard DOS format; but since most "uncopyable" disks now use non-standard formats, this utility is not useful if you plan to be a disk pirate.

One Apple-Aids utility can convert numbers from one base to another—binary, octal, decimal and hexadecimal. A couple of other utilities help you create and edit Apple EXEC files.

But Apple-Aids' avowed main purpose, and certainly its showpiece utility, is its disk editor. This utility can load from or write to any sector of any track; edit in either decimal, hexadecimal or ASCII; disassemble any sector, using standard 6502 mnemonics; and toggle between the CRT screen and the printer.

The disk editor will be useful mainly to machine-language programmers, since it can be used to list and edit machine-language programs. In theory, the editor can also be used to list and "repair" programs in any language; but the programmer doing this will have to be completely familiar with how the particular language is stored on a disk.

You will discover, for example, that Basic programs stored on a disk contain "inverted" (black on white) characters; you'll have to know their ASCII equivalents and their purposes before you try editing them.

Still, the disk editor could be a disk-saver for disks that have suffered electronic (rather than physical) damage. If you're lucky and know what was supposed to be in the "damaged" bytes, you can simply edit the damage out; at the very least, you should be able to list out what remains and painstakingly reconstruct your programs.

Apple-Aids also has a text dump routine that is separate from the print routine in the disk editor utility.

In general, Apple-Aids is user-friendly, and it does what it is supposed to do. You're presented with a simple menu at the beginning of each routine, and the directions within each routine are usually clear. Users with one disk drive will have to shift between the Apple-Aids and the

disk they're working on, but they are probably resigned to this procedure by now anyway.

User errors are trapped efficiently most of the time, and you're given directions for recovery. But you should still be cautious; the program is powerful, and it is easy to make unintended changes in your disk. It is best to follow the advice of the user's manual and have a backup copy of any disk you're working on.

The user's manual is concise, but clear and reasonably complete. There is no tutorial, but numerous illustrations show how the screen looks during the various routines. Perhaps the most serious omission is that you're not warned to cover the "write protect" notch of the Apple-Aids disk itself.

So if you're a serious programmer and your disk drives are the backbone of your system, and you have (or anticipate having) disk problems, give Apple-Aids a try. It may be just what the doctor ordered. (Advanced Operating Systems, 450 St. John Road, Michigan City, IN 46360.)

Brownlee Elliott
Bloomfield Hills, MI

Alien Lander, Retro-Ball

Sierra software
Unwraps a package
For game players

Alien Lander is a single-player game billed as a 3-D landing simulator. While not truly three-dimensional, the landscape is drawn in perspective that changes with altitude, giving a somewhat 3-D appearance. You start the game by booting the disk, which then remains in the drive since it will be accessed later.

Before entering the game proper, you must set the conditions for the planet on which you will be attempting to land. Press a number key from 1 to 9 to set gravity. Each increment is equivalent to 1/6 of earth gravity. Pressing the 6 key sets gravity equivalent to that of the earth, or 1.

The next setting is for thrust, again in 1/6 g increments, but above and beyond the pull of gravity. For example, a gravity of 6 and a thrust of 3 would equal $(6 + 3) \times 1/6$, or $1\frac{1}{2}$ g's of thrust. You next enter the density of the atmosphere in 1/6 increments of the earth's atmosphere.

By adjusting these three parameters, you can simulate a wide variety of landing conditions.

You begin with 90 seconds of fuel. Burning the fuel slows the rate of descent. Fuel is burned by entering a number between .01 to 99.9 into the fire register, then pressing enter or by pressing either of the buttons on the game paddles.

The viewpoint is from inside the ship, looking at a viewing screen. Along the

bottom is a "digital instrument panel," which keeps you informed of altitude, velocity, fuel being burned, the time and remaining fuel. Initially, the view shows a space background and, as the altitude decreases, the landscape comes gradually into view.

The ship's "onboard computer" is activated by pressing I or A. I is Inquire Mode, and returns the ship's current status. A provides advice on correcting problems which may have been encountered in the Inquire Mode. The screen is continuously updated while in either mode, and return to normal video is accomplished by pressing the space bar.

If your velocity gets too high, the ship will overheat. Twenty seconds of this without slowing the rate of descent will cause the ship to burn up and explode in the atmosphere.

A landing velocity of 60 kph will get you down alive, but the ship will be permanently damaged. A safe landing velocity is 0-29 kph.

After landing, press the F key to take off again, but don't wait too long—you may have some "company" outside.

Retro-Ball is a simulation of Air Hockey with a new wrinkle—the puck has a rocket attached to it.

Retro-Ball uses the Apple game paddles and also requires that a modification called Videosync be installed in the Apple. This is merely a jumper that goes between the Apple's auxiliary video pin and the cassette-in jack. The jumper is supplied with the proper plugs attached and takes only a moment to install. The game will not run without it.

Videosync monitors the Apple's video output through the cassette port, keeping track of where the scan line is on your video monitor or TV. The program thus knows when to draw and when not to draw on the high-resolution screen, resulting in extremely smooth, unflickering motion.

Play can either be by two people or by one person against the computer. The playing field is a rectangular court with a white line dividing the center, and a small white rectangle at each end representing goals.

The game begins with a toss-up on the center line, with both players having partial control at this time. Full control is gained by turning the paddle knob and simultaneously pressing and releasing the paddle button continuously.

Points may be scored by shooting the ball into the center of the opponent's goal and, secondly, by forcing your opponent to hold the ball more than four seconds.

Turning the paddle knob rotates the ball, orienting the direction of the rocket. Pressing the button fires it. This isn't a game to be mastered in one sitting—it will provide many hours of enjoyment.

For Apple II disk system owners both

games are well thought out, with excellent color graphics. Packaging ranks among the most attractive I have seen, consisting of a large plastic envelope with a colorful insert showing through. Player's manuals are included with both games.

Retro-Ball is priced at \$29.95 and Alien Lander is \$24.95. Sierra Software is at 536 East Sahara Avenue, Las Vegas, Nevada 89104.

For the acid test, I took these games to The Software Center in Florissant, MO, and collared two game players named Rich and Terry, ages 13 and 15, respectively. After several rounds, both agreed that the games were interesting and not too easy to make one tire of them quickly.

What greater accolade could one desire than this from two experts?

(Sierra Software, 536 East Sahara Ave., Las Vegas, NV 89104. Alien Lander, \$24.95; Retro-Ball, \$29.95.)

Ronald Bobo
St. Louis, MO

Lucidata Pascal

The best Pascal For Heath Gets even better

When I wrote a review of Polybytes' implementation of Lucidata Pascal Version 2.8 for the Heath/Zenith computers (April 1982, p. 203), I felt this was the best Pascal I'd found that allowed me to make maximum use of the Heath Disk Operating System (HDOS) features. However, I have changed my mind, since Polybytes has released Lucidata Pascal Version 3.8, with great improvements.

One of the most important changes was to make this new version available in CP/M as well as HDOS formats. Both versions use ten-sector, hard-sector 5¼-inch disks, but most Heathkit Electronic Centers and many other commercial and private sources can convert from those formats to others. The 8080/Z-80 microcomputer user can run this cost-effective Pascal on most disk systems, and take advantage of his favorite editors and other utilities that would normally not be available to users of p-code Pascal.

Version 3.8 makes full use of David Gibby's P-6800 Pascal p-code generating compiler. It includes a run-time package for the Heath H8 and H89/H90 computers running under HDOS. For the CP/M version, the run-time package presumably interfaces with CP/M's BIOS (Basic I/O System).

The run-time systems are provided in both 8080 and Z-80 code, allowing total compatibility between the H89 and H90 with their Z-80s and the older H8 with its 8080. The former can use the slightly faster Z-80 run-time package, while the latter can run the same programs using

the 8080 run-time package. This approach prevents the Pascal package from becoming dated as 8080 users upgrade to Z-80 processors.

Lucidata Pascal is a subset of the ISO Standard Pascal, with certain input/output enhancements added to make practical programming easier and, in this case, to make fullest use of the capabilities of HDOS. The data type REAL is supported, but RECORD is still absent (you will have to do your own defining to get this feature, which is not a real problem).

Procedures, functions, multi-dimensional arrays, recursion and file types are all supported. All the branching constructs are present, including IF.. THEN..ELSE and CASE..OF. REPEAT.. UNTIL and WHILE..DO are present, as are the data types CHAR, BOOLEAN, INTEGER, BYTE and ALFA (a six-character string) and scalars, which can be members of SETs. New to Version 3.8 are the procedures NEW, MARK, RELEASE, SQRT, SIN, COS, EXP, LN, ARCTAN, ASSIGN and OVERLAY.

Lucidata Pascal provides the standard I/O procedures of RESET, REWRITE, READ, WRITE, POSITION, READLN and WRITELN; now ASSIGN has been added. HALT is available, and you have the ability to define USER functions to pass control from a compiled Pascal program to the user code. The normal ordinal and predicate functions of CHR, ORD, SUCC, PRED, ODD, EOLN and EOF are provided, as are CARD, UNPACK, INPORT and OUTPORT, and the standard arithmetic and transfer functions such as ASB, SQR, TRUNC and ROUND.

New to this version are the constant CHAR (for example, you can define BELL=CHR(7)). You may now write ALFA=ARRAY [1..8] OF CHAR SET [null..rubout] OF CHAR. Version 3.8 responds to lowercase as well as uppercase, and recognizes comments delineated by brackets { } as well as (**).

The data type POINTER has been added. This was possibly one of the most significant omissions in the earlier versions. CASE now allows multiple labels and OTHERWISE, and Boolean relationals may now be applied to RECORD and ARRAY types.

Many other features have been added. Parameters are now fully type-checked and may be passed by reference (VAR). A SINCLUDE directive has been included for inserting additional files at compile time, and \$GEN has been added to allow binding of p-code to a minimal run-time package to save memory space when things get tight.

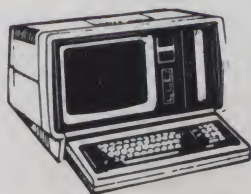
And things will get a bit tighter now, as the compiler takes 130 HDOS sectors (up from 99), which equates to about 33K bytes of disk space. Two drives are now almost essential (although you can get by with one, with some switching of disks), and you'll need 56K of RAM to prevent paging of the files. The virtual memory feature has been retained, however, and



\$ SAVE \$

Software at SUPER DISCOUNT PRICES

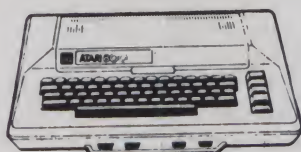
the best available on the
market today for



TRS-80



apple computer



ATARI

GAMES ★ UTILITIES ★ BUSINESS
for the budget minded individual

**ONE OF THE WORLD'S
LARGEST INVENTORIES**

We have all the latest
software—ASK US!

**A-BARGAIN Distributors
COMPUTER GAMES SPECIALISTS**

Circle 314 on Reader Service card.

P.O. BOX 24121—F
OAKLAND, CA 94607

if you can abide the additional waiting during compilation, you can run in as little as 32K.

Also new is the ability to declare any number of procedures and functions EXTERNAL and linked to user-provided assembly-language code, replacing USER.FORWARD referencing of procedure and function blocks is now possible, and you may now use formatted print output expressions such as WRITE(X:I:J), where the number X will be printed with I digits, J appearing to the right of the decimal point.

Version 3.8 allows you to allocate address space on the run-time stack or at absolute memory locations by the use of the pragmas \$STACK and \$ABSOLUTE, replacing PEEK and POKE. (Pragmas are implementation-specific features that are not a part of the ISO Standard Pascal.) Also, SETS may now have up to 128 elements.

The manual, including seven appendices, is now about 90 pages long, and still includes syntax diagrams, a description of the resource utilization, a section on fine-tuning programs and a section on customizing the run-time package. This last makes use of a well-designed patch utility that allows the use of non-HDOS device drivers. The method of altering stack size and memory limits is also covered, and a section is provided that shows how to customize the run-time

packages to a greater degree than previously possible.

Included on a diskette (the Pascal compiler, the 8080 run-time package and the Z-80 run-time package require a disk of their own) is a set of demonstration programs that are invaluable as an introduction to this implementation. The programs, ranging from a sample of the use of ALFA to a demonstration of USER-CODE, are invaluable as learning tools and an introduction to the spirit and function of Pascal. These demo programs are ready to compile and run, and include a VALIDATE routine to test the compiler and run-time package as soon as you start the system.

Version 3.8 of Lucidata Pascal does not incorporate the built-in graphics commands in Ver. 2.8G. It would, of course, be easy to write your own graphics-handling procedures for any display; this is one of Pascal's strongest features. The modified version that does incorporate these special commands for handling the Heath HA8-3 color graphics board will continue to be made available, and these modifications make Lucidata Pascal nearly the perfect graphics language, quick and easy to write, fast running and fully documented.

(Polybytes, 325 19th Street S.E., Cedar Rapids, IA 52403. \$145. Update is \$60.)

**D.C. Shoemaker
Blacksburg, VA**

OMNITEK COMPUTERS INTERNATIONAL, INC. 1300 MAIN STREET TEWKSBURY, MASS 617-851-4580

Circle 140 on Reader Service card.

RS232 Direct Connect Modems.....	99.00
Scotch S.S/D 5.25" Diskettes.....	25.00
Verbatim 5.25" D. L.....	25.00
16K RAM KITS.....	14.00
TECO 12" B&G Monitor.....	119.00
Okidata Microline 80.....	329.00
Okidata Microline 82A.....	449.00
Okidata Microline 83A.....	699.00
Epson Mx-80.....	479.00
Epson MX-80 FT.....	579.00
Radio Shack IIII w/48K.....	879.00
Radio Shack IIII w/48K and 2 40T dr	1699.00
and RS232 ..	1799.00
40 track 5.25" Tandon TM-100-I.	284.00
80 track 5.25" Tandon Dual Head.	484.00
5.25" Power Supply and case.....	49.00
8" Power Supply and case.....	99.00
CENTRONICS 739 Printer.....	499.00

TRS-80 is a registered trademark of
Tandy Corp.

Prices are for mail order only.
TERMS: Check, money order, Mastercard
and Visa accepted. F.O.B. Tewksbury-
freight extra. Mass residents add 5%
sales tax. Write for FREE CATALOG.



Fly Around the World!

(and develop a world of business!)

Expand your sales world-wide. Meet importers and manufacturers in Asia and Europe at a series of electronics/computer trade shows arranged for your convenience in Tokyo, Taipei, Hong Kong, Beijing, Canton, Seoul, and Munich. Join about 200 fellow businessmen in taking advantage of this world market for sales and buying. Despite the reasonable tour price it includes some fabulous meals and first class hotels.

Far East Electronics Tour
(Oct. 24–Nov. 7, 1982)

Optional Around-the-World Tour
Including Electronica '82 in Munich
(Nov. 9–13, 1982)

Call Kathy collect for more information.
Tel.: (415) 433-3072; (415) 433-3408

Commerce Tours International
870 Market Street, Suite 742
San Francisco, CA 94102

IBM PERSONAL COMPUTER USERS

COMPLETE YOUR REFERENCE LIBRARY

Que On Systems

IBM's PERSONAL COMPUTER

Que Corporation's new 300 page book, IBM's PERSONAL COMPUTER describes the hardware, peripherals and IBM's program library. Whether you are an IBM Personal Computer user or prospective buyer, you will discover the significance of IBM's new product to your personal or business applications.

...at computer stores and fine book stores \$14.95

and...

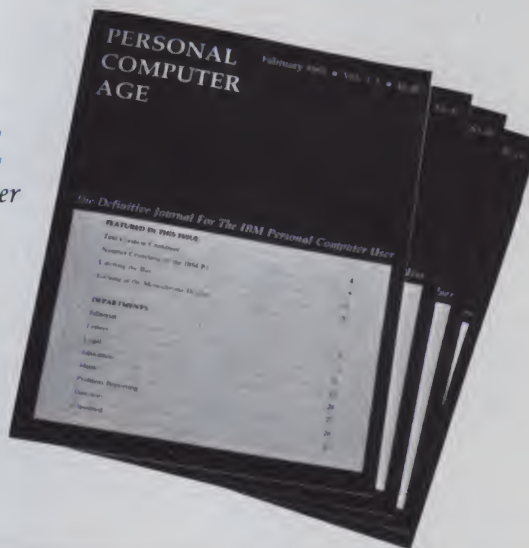
PERSONAL COMPUTER AGE

The Definitive Journal For The IBM Personal Computer User

Keeps you updated monthly with the latest news and applications for your IBM Personal Computer. Featuring: Hardware and Software Reviews — New Product Announcements — Technical Articles — Problem Reporting — Vendor Directory — Classified Ads — Special Interest Columns.

\$18.00/YR.
(12 issues)

BOTH FOR ONLY \$22.95



PERSONAL COMPUTER AGE

For Credit Card Orders, Dial Toll Free
(800) 227-2634 ext. 936
In California
(800) 772-2666 ext. 936

Circle 370 on Reader Service card.

- ☐ I Want Everything —
PERSONAL COMPUTER AGE
and IBM's PERSONAL COMPUTER
for \$22.95
- ☐ NEW ☐ RENEWAL
- ☐ Send the Book only
for \$14.95
- ☐ Just enter my subscription
to PERSONAL COMPUTER AGE
for \$18.00
- ☐ Payment Enclosed

Charge my: ☐ VISA ☐ MASTER CHARGE

Card # _____

Expiration Date: _____

Authorized Signature _____

Name _____

Address _____

City _____

State _____ Zip _____

PERSONAL COMPUTER AGE P.O. BOX 70725 Pasadena, California 91107 Dept. K1

VisiCalc-like Report Writer Bargain-Priced CP/M Speller First Aid for Apple Disks Sierra Software Keeps You Entertained New, Improved Heath Pascal

DeskTop Plan II

VisiCalc gets a companion
To generate
Financial reports

DeskTop Plan II is a program for preparing and printing financial business reports. By constructing a series of models, any number of "what if" questions can be studied and mulled over.

If this description sounds familiar, don't be surprised. This program is distributed by the same publishing house that brought you VisiCalc, the electronic spread sheet. So, what can DeskTop Plan do that VisiCalc cannot do better?

Both programs perform calculations, but while VisiCalc is set up for almost any kind of mathematics including transcendental functions, DeskTop Plan is limited to the simple arithmetic of addition, subtraction, multiplication and division.

For strictly business applications this limitation becomes a definite plus. Trigonometry has no place in accounting or business trend forecasting. So, there is more room in your computer for report writing, and that is the purpose of DeskTop Plan.

There is space in the program for custom calculations rules, but for this, the ability to program in Applesoft is required.

DeskTop Plan II can be a tremendous worksaver. It is easy to learn and use. I constructed a simple personal budget with inflation factors built in, for the years 1982 to 1990, after studying the program for about 20 minutes.

DeskTop Plan II shows the calculation rules required to perform the arithmetic. All calculations have to be performed on whole rows or columns. The flexibility of VisiCalc is missing here. However, most business applications result in rectangular formats anyway.

After completing your model and the appropriate calculations, you can go di-

rectly to the print module. A very business-like report, including customized headers and footers, is produced.

If you want a pictorial display, there are two utilities for plotting graphs. You can plot simple line and bar graphs directly or convert DeskTop files to Apple Plot files for more complicated configurations. After display, graphs can be printed directly if you have an Apple Silentyte printer.

It is also possible to convert VisiCalc files to DeskTop Plan and vice versa. However, if you have a good VisiCalc model and want to use the efficient DeskTop report format, it would seem easier to simply reenter pertinent data into DeskTop Plan rather than go the complicated conversion route.

To convert a VisiCalc file you first have to save it as a /PF file while your spread sheet is in RAM in the Apple. (The manual erroneously lists the command as /PD.) Then, after loading DeskTop Plan again, the conversion utility is brought up. You are prompted through the various steps, but it is easy to misunderstand the questions.

The documentation comes in the well-known padded brown three-ring binder and consists of 200 well-written pages. Many examples are given, but an alphabetic index is lacking.

Minimum requirements for DeskTop Plan II are an Apple II, II+ or III with 32K of RAM, one disk drive, monitor or TV and an 80-column printer. A second disk drive is highly recommended, especially since there is very little room on the program disk for new data. If you have only one disk, it is recommended that you delete all of the Topnotch and XYZ files.

The Applesoft file can also be deleted if you have an Apple II+ or III. The Print AIII file can be deleted if you are using an Apple II. All this deleting will then make space for one or two of your own models. A 132-column printer and an additional 16K of RAM are also recommended.

DeskTop Plan II is handy as a financial report generator. It is easy to use and handy in conjunction with VisiCalc. (Visicorp, 2895 Zanker Road, San Jose, CA 95134. \$199.)

G.R. Brieger
Redmond, WA

Spell

Low-priced
Spelling program
For CP/M systems

How can you resist a bargain-basement price of \$49.95 for a speller that claims to recognize over 50,000 words and requires only 31K? I couldn't, and responded to the ad for Spell.

Spell contains three different dictionaries—one for use with a 64K system, the other two for 48K systems. The run module and the large dictionary require approximately 46K of your disk file space. This is still small enough to tack onto each copy of your word processor without seriously reducing available disk space.

The speller combines basic roots of about 18,500 words with prefixes and suffixes to check an estimated 50,000 words, including common names. This method does permit some odd misspellings to slip by on occasion, although the documentation claims a 96 percent recognition rate when checked against a 42,000 word dictionary. Our experience with the program is that the claimed undetected error rate of 2.2 per 1000 for the 64K dictionary is reasonably accurate.

As with most spelling programs, the usual mode of operation is a scan of the file, then a presentation of each unrecognized word. You have the choice of marking the word for later correction, ignoring it, adding it to the dictionary or adding

(continued on page 156)

FDC SBC

SYSTEMASTER®

The Next Logical Step

Teletek FDC-I, The First Step

A CPU, floppy disc controller and I/O all on one board. Until SYSTEMASTER® the most powerful IEEE-S-100 board on the market.

Teletek SBC-I, The Second Step

A board designed for use in high performance, multiprocessing systems. SBC-I combines its own CPU, serial and parallel ports, 128K of segmented memory and FIFO.

SYSTEMASTER®, The Next Logical Step

Teletek's newest product — a breakthrough in S-100 board design. SYSTEMASTER® is a complete system. No other boards are required. It doesn't even require a bus!

But, when used with an S-100 bus, SYSTEMASTER® has even more capabilities. You can readily expand to multi-user or multi-processor systems using SYSTEMASTER® as the master board.

SYSTEMASTER® Features:

- Floppy controller: controls mini and/or maxi drives; variable independently-adjustable pre-write compensation.
- CPU: 4MHz Z80A
- Two RS-232C ports.
- Two full parallel ports.
- 64K bank-selectable memory variable from 32K to 60K. Remaining memory is fixed at top of 64K address space.
- DMA: allows transparent data transfer to floppy disks and other devices without CPU wait states.
- Relocatable EPROM/ROM/PROM: 2K, 4K or 8K with deselect capability.
- Real-time clock.
- Operating systems available: Digital Research or Turbodos.
- Parallel ports may be connected to Teletek's PSC board for RS-422 capability.

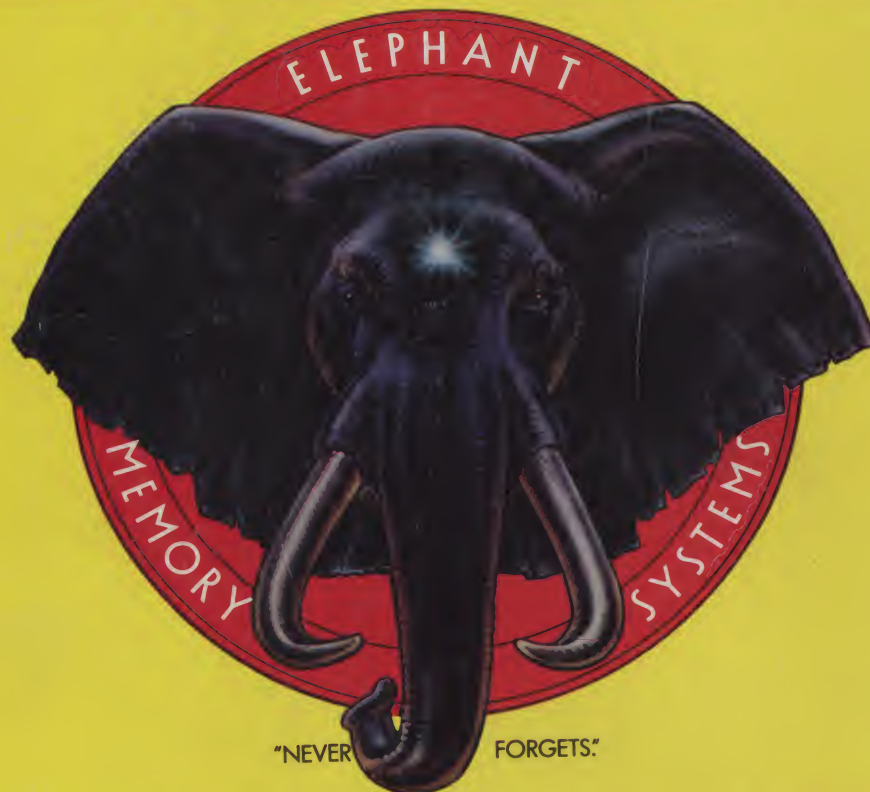


TELETEK

65

9767F Business Park Drive Sacramento, CA 95827 (916) 361-1777

REMEMBER:



MORE THAN JUST ANOTHER PRETTY FACE.

Says who? Says ANSI.

Specifically, subcommittee X3B8 of the American National Standards Institute (ANSI) says so. The fact is all ElephantTM floppies meet or exceed the specs required to meet or exceed all their standards.

But just who is "subcommittee X3B8" to issue such pronouncements?

They're a group of people representing a large, well-balanced cross section of disciplines—from academia, government agencies, and the computer industry. People from places like IBM, Hewlett-Packard, 3M, Lawrence Livermore Labs, The U.S. Department of Defense, Honeywell and The Association of Computer Programmers and Analysts. In short, it's a bunch of high-caliber nitpickers whose mission, it seems, in order to make better disks for consumers, is also to

make life miserable for everyone in the disk-making business.

How? By gathering together periodically (often, one suspects, under the full moon) to concoct more and more rules to increase the quality of flexible disks. Their most recent rule book runs over 20 single-spaced pages—listing, and insisting upon—hundreds upon hundreds of standards a disk must meet in order to be blessed by ANSI. (And thereby be taken seriously by people who take disks seriously.)

In fact, if you'd like a copy of this formidable document, for free, just let us know and we'll send you one. Because once you know what it takes to make an Elephant for ANSI...

We think you'll want us to make some Elephants for you.

ELEPHANTTM HEAVY DUTY DISKS.

Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021
Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.